# AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

DECEMBER 1, 1960


## Features • • •


**MACHINING PARTS FOR '61 OLDSMOBILES**

**CASTING ALUMINUM CYLINDER BLOCKS**

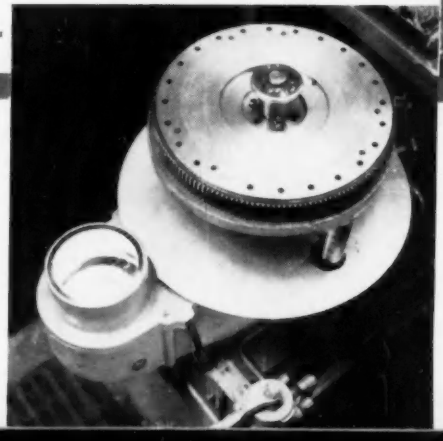
**LINCOLN-CONTINENTAL QUALITY EVALUATION**

**BODY ENGINEERS HOLD ANNUAL CONVENTION**


**Automobile Engines in Saab Factory** ▶

Power plants in the Saab Gothenburg factory ready for shipment to the plant in Trollhättan, where they will be installed in cars

PAGE 42



◀ **BALANCING FLYWHEELS AT OLDSMOBILE**

*Flywheels are balanced to ¼ oz-in. by means of aluminum pins inserted in pre-drilled holes*

*starting on page 33*

# At Amana Refrigeration, Inc.

# STANOIL

## IMPROVES PRODUCTION
## REDUCES MAINTENANCE

### Smooths operation of 600 ton hydraulic press

**Situation:** The 600 ton Verson Press at Amana is a vital operating component in the manufacture of home freezers and refrigerators. Its proper performance is necessary to the efficiency of Amana's entire manufacturing operation. That's why erratic press operation, caused by foaming of the hydraulic oil, was a serious problem.

**What was done?** In seeking the solution to this problem, Amana consulted their Standard Oil lubrication specialist who recommended STANOIL for this service. STANOIL Industrial Oil is a top quality, first-line industrial lubricating and hydraulic oil. It will provide excellent service in many different applications. And when tested by Amana, STANOIL proved perfect for use.

**What has happened?** Since STANOIL was first put to work at Amana, it has performed for extended periods of time without foaming or oxidation, lengthening the time between drainings and improving press operation. As a result of this record, STANOIL has been adopted for use on other production equipment, together with Standard's RYKON Greases and SUPERLA Soluble Oil.

**What you can do:** To get help in solving your lubrication problems and to learn more about STANOIL Industrial Oils, simply call the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.**

**You expect more from STANDARD and you get it!**

Standard's Jess Nelson (center) and Gene Maske (left) checking lubrication survey with Leonard Rettig, Amana's plant maintenance superintendent. Jess, who is District Engineer for Standard, is a specialist in this kind of operation. He has an engineering degree from the University of Iowa, and has also graduated from the Standard Oil Sales Engineering School.

Circle 101 on Inquiry Card for more data

# DETREX 910

Here's a brand new approach to iron phosphate coating.

Detrex 910 chemically cleans and phosphate coats in one operation. It is designed for use in continuous mechanical spray washing equipment ranging from a 2 to a 6 stage operation.

**ARE YOU IN A HARD WATER AREA?** This field tested and fully guaranteed product is so compounded that it will accept at least fifteen times more alkali than other products and still remain in the PH coating range to produce superior iron phosphate coating. This unique alkali tolerance permits Detrex paint-bond 910 to be used in practically all areas of the United States without special PH control.

It's a "double-barreled" advancement that can mean important savings to you. Our field engineers will be glad to furnish the details.

DETREX CHEMICAL INDUSTRIES, INC.

P.O. Box 501, Dept. AI-1260, Detroit 32, Mich.



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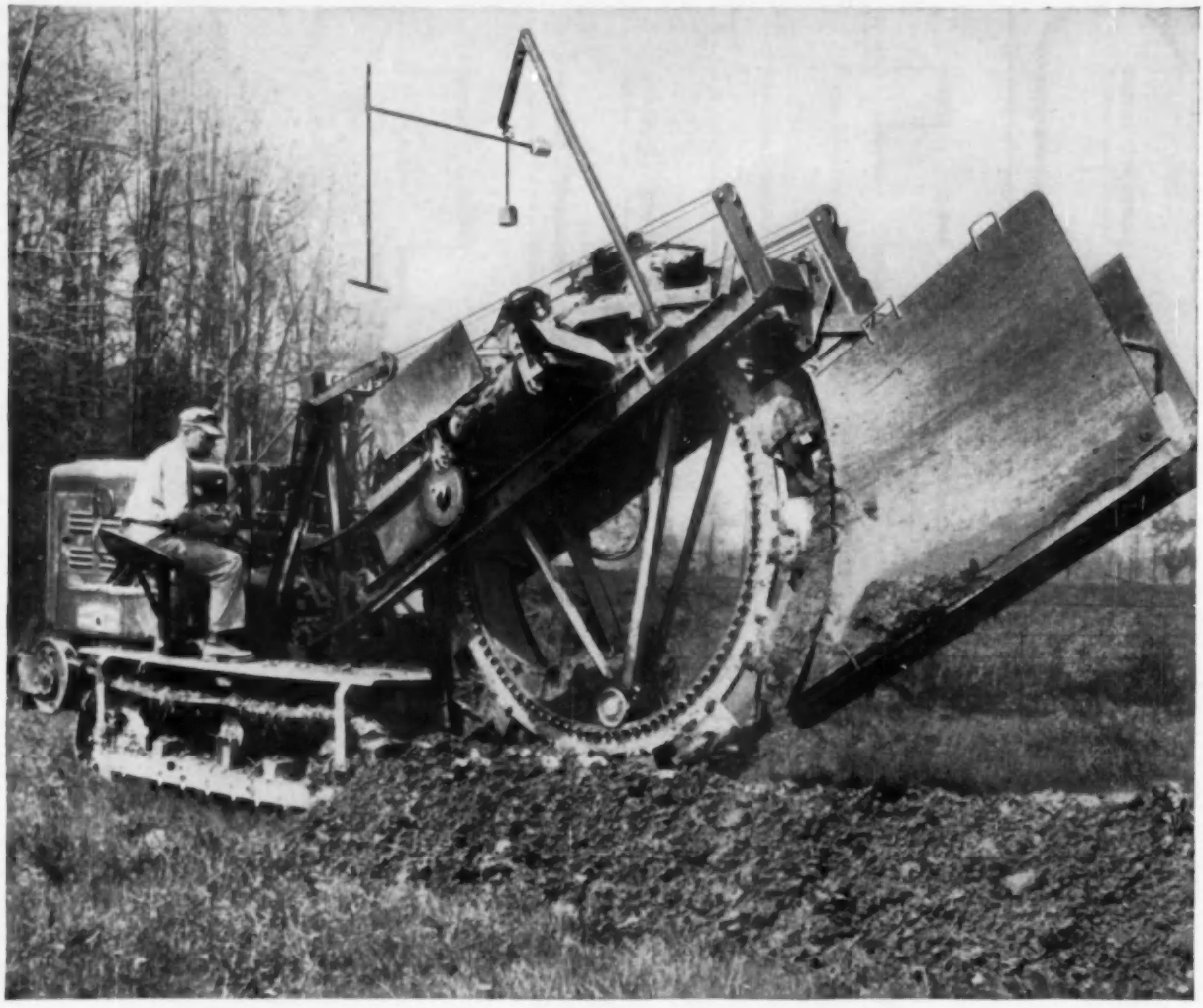

# Digs 1,000,000 feet of trench without a breakdown—proof of 4340 nickel steel's strength and toughness!

*This through-hardening nickel alloy steel is used in this Cleveland Trencher's traction-output shafts, final-drive countershafts, and digging-wheel lower-truck shafts. Operating loads hit 150,000 psi. AISI 4340 takes these loads in stride – day after day after day!*

When this Cleveland Model J-30 Trencher, owned by Mr. Howard Zacharias of Wellington, Ohio, is on the job, components in this trencher have to stand up to operating loads of 150,000 psi. Imagine the shock-loads that occur when the buckets come cracking through the ground – hitting rocks, roots, and buried metal.

With high operating loads, with the constant threat of severe shock loads, designers of the Cleveland Trencher, Model J-30, selected 4340 nickel alloy steel for this trencher's important components – traction output shafts, final-drive countershafts, digging-wheel lower-truck shafts.

**4340 pays off in trouble-free performance.** Made of a reliable through-hardening steel–strong and tough all the way through – these medium-to-heavy-sectioned parts deliver the abrasion and wear resistance needed for earth-moving service.

**But what about your "no-breakdown" experience?** Can this nickel alloy steel help you? AISI 4340 nickel alloy steel is readily available off the shelf at Steel Service Centers from coast to coast. It provides the mechanical properties that make for trouble-free performance of a variety of heavily-stressed components in heavy-duty construction equipment—gears, shafts, and bearings. Other nickel alloy steels, possessing special properties for specialized applications, are also widely available.

Write for a copy of the new 76-page booklet, "Nickel Alloy Steels and other Nickel Alloys in Engineering Construction Machinery." It's yours for the asking.

**THE INTERNATIONAL NICKEL COMPANY, INC.**

67 Wall Street INCO New York 5, N. Y.

**INCO NICKEL**

NICKEL MAKES STEEL PERFORM BETTER LONGER



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# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

DECEMBER 1, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 123, No. 11


## Features • • •


▼ **Machining Oldsmobile Components**

A flywheel machining department and a transfer machine line for machining aluminum cylinder heads are among the features at Oldsmobile which are described here. Page 33

▼ **Producing Aluminum Cylinder Blocks**

The die-cast block for American Motor's OHV Six is machined on an impressive line of transfer machines. Page 36

▼ **New Engine Has Stainless Steel Cylinder Block**

A high performance, custom engine uses Type 302 stainless steel construction, fabricated by hydrogen brazing. Page 39

▼ **Casting Aluminum Cylinder Blocks**

Central Foundry Div. of GM is casting aluminum blocks and heads in its Defiance, Ohio, plant for three engines used in General Motors' cars. Page 40

▼ **Automobile Production at Saab**

A progress report on new cars and expansion plans of the Swedish builder. Page 42

▼ **Quality Evaluation Procedures in Lincoln-Continental Assembly**

Every step in the production of Lincoln-Continentals is subject to inspection and testing stemming from the Quality Evaluation program. Page 46

▼ **ASBE Holds Annual Technical Convention**

A wide variety of subjects of interest to engineers and stylists were covered at the 15th Annual Technical Convention of the American Society of Body Engineers. Page 49

▼ **Aircraft Hydraulic Conference**

Jet airline operations and aerospace fluid systems were under scrutiny at the 10th Annual Conference sponsored by Vickers, Inc. Page 50

▼ **Electronic Control of Inventory**

The Hastings Manufacturing Co. is using a random access data processing system to reduce obsolescence of parts and to cut back-orders. Page 52

▼ **Superfinishing Bearing Raceways**

A new machine at International Harvester is finishing roller bearing raceways in 10 seconds. Page 77

▼ **20 New Product Items and Other Features Such as:**

Machinery News; Manufacturers' News; Auto Technics Data; and Industry Statistics.


*. . . continued on next page*


MEMBER SBME Society of Business Magazine Editors

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NBP National Business Publications, Inc.

BPA Business Publications Audit of Circulation



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## Departments • • •

### NEW!—"AUTO-TECHNICS DATA SHEETS"

IN this issue appears for the second time, a new AI department entitled "AI Auto-Technics Data Sheets." First appearing in last issue (AI, November 15, page 93), this helpful department heralds a continuing study on "Basic Automotive Design and Production Technical Data for Permanent Reference."

The Data Sheet, this issue, page 71, tears out along the dotted line, with standard 3-hole-punch indication, and makes for easy loose-leaf insert into your other valuable engineering records.

The subject, this issue, is: Average B.M.E.P. at Maximum Horsepower, 1936-1960, as applied to passenger car engines for these years. Information, at a glance, is both listed numerically, and plotted by graph.

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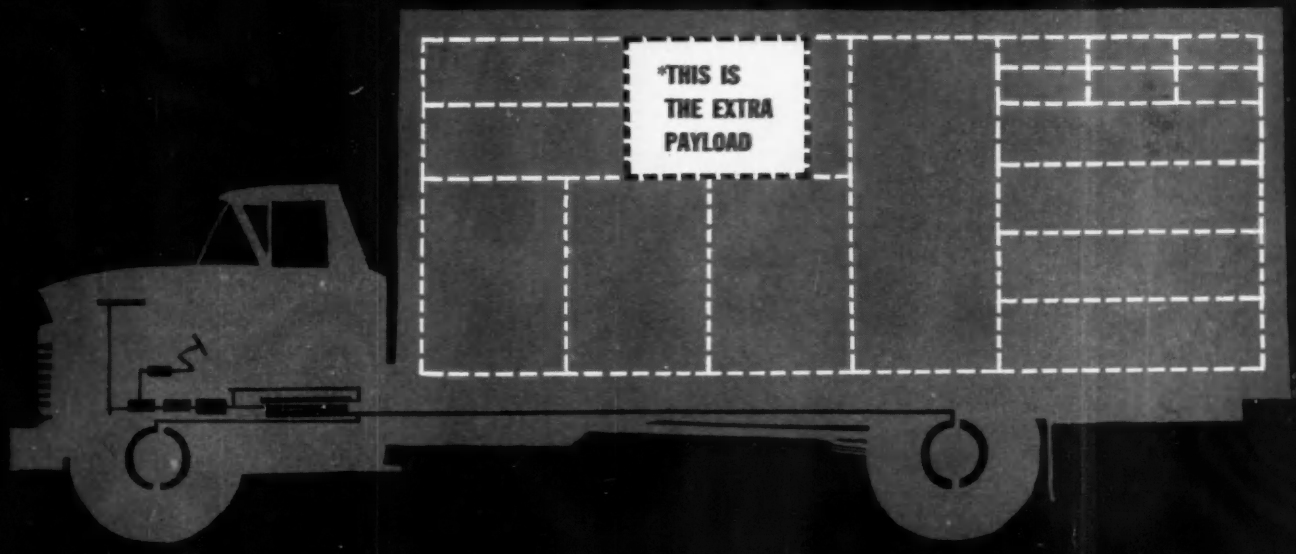
# BENDIX® HYDROVAC® POWER BRAKES

## pyramid profits with extra payload*




**PAYLOAD**—Hydrovac Power Brakes weigh less, permit increased payloads up to several hundred pounds.

**PRICE**—Hydrovac Power Brakes cost *less to buy, less to operate, less to maintain.*

**PROTECTION**—*Built-in standby safety . . . manual braking available in case of power failure.*

**More Bendix Hydrovac vacuum power brakes are in use than all other makes.**

Bendix PRODUCTS DIVISION South Bend, IND.

THE Bendix CORPORATION



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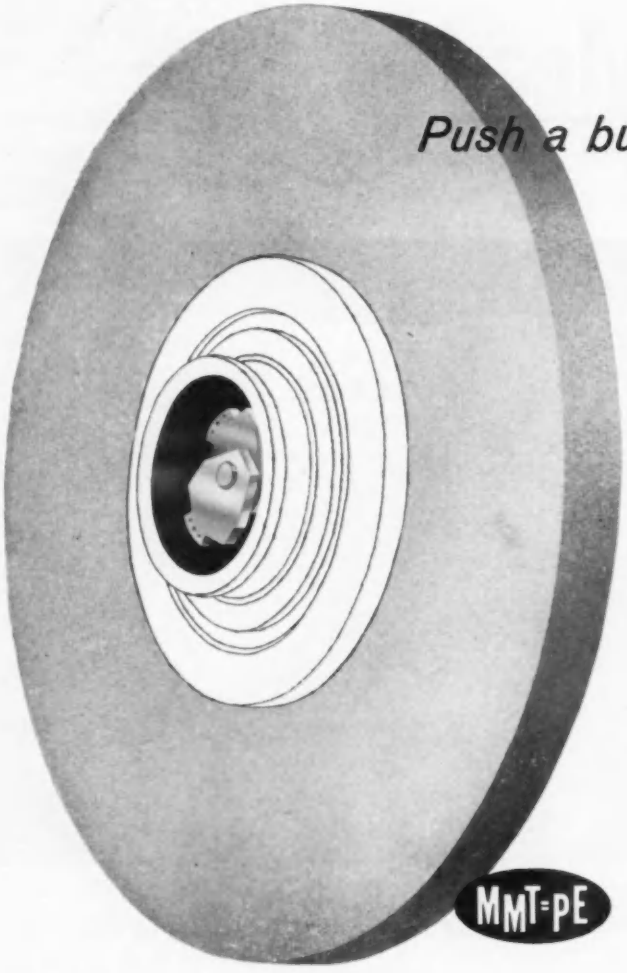
**A. Unbalance.** Badly out of balance wheel is shown in grinding position on the NORTON Balancer. Pendulum weights are locked in balance correcting position for wheel previously in use. Heavy spot, shown by yellow area, tends to displace center line of wheel spindle from normal center of rotation.

# Push a button to balance

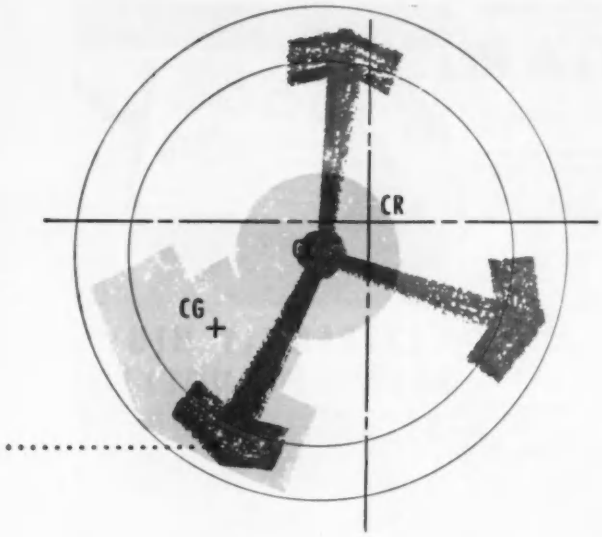



**B. The Button Is Pushed.** Wheel adapter assembly moves to soft spring suspension. Assembly tries to rotate about center of gravity. Centrifugal force acting outwards from center of rotation causes pendulum weights to move away from heavy spot, as shown.

**C. Balanced in 5 Seconds.** Pendulum weights have moved to the correct balancing position opposite the heavy spot. Center of gravity, center line and center of rotation are now common as shown. Weights lock and wheel adapter assembly returns to grinding position.

Unusual simplicity of the new NORTON Automatic Wheel Balancer introduces new advantages to unusual grinding operations. The wheel spindle and bearings are never released from carefully fitted housing. Balancing action is developed by slight release of only the wheel assembly from nose of spindle, permitting the assembly to be carried while balancing on a floating spring shaft. Three pendulum type balancing weights give maximum sensitivity to positioning forces. Wheel assembly and balancing weights are clamped and released automatically. Loosening a single spanner nut enables quick wheel changes. Safety interlock prevents operation of mechanism during grinding.

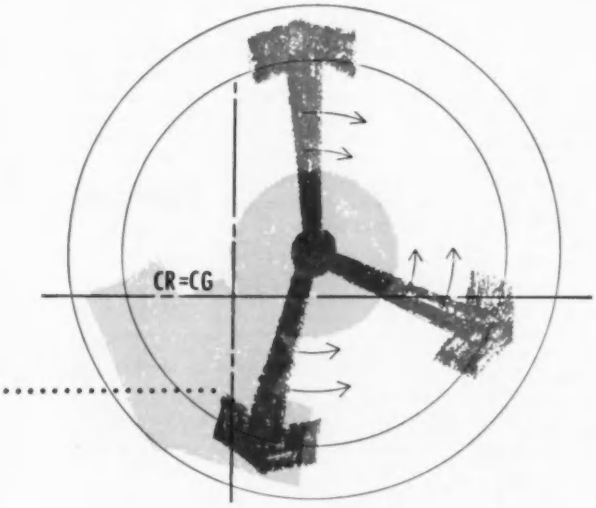
**NORTON PRODUCTS:** Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

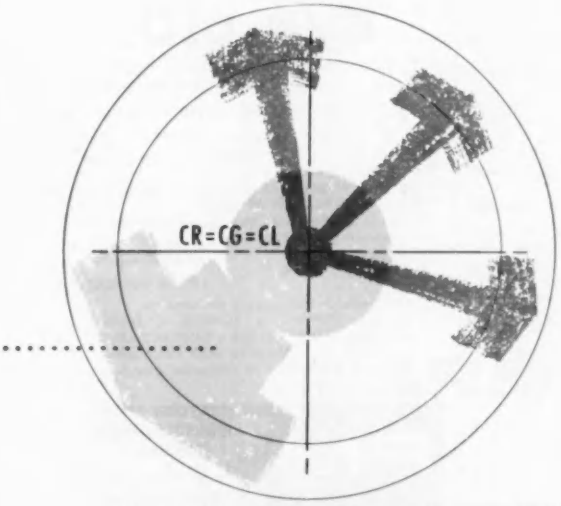



CG = Center of Gravity
CL = Center Line of Wheel Spindle
CR = Normal Center of Rotation

# *grinding wheels precisely . . .*

## *automatically in 5 seconds*




New and optional, the NORTON Automatic Wheel Balancer simplifies an extra operation for extreme precision grinding.

Engineered for ruggedness and high precision, NORTON cylindrical grinders have long been recognized for producing completely satisfactory results without wheel balancing — on or off the machine.

That holds good for all but a very small minority of grinding jobs calling for the absolute extreme in precision grinding. It is for such special requirements that the NORTON Automatic Wheel Balancer is designed.

*That is why it is optional on most NORTON cylindrical grinders — and that is how it teams up to produce more positive precision than has ever been obtainable with previous wheel balancing methods.*

Read the diagrammed descriptions shown here. See how simply, surely and swiftly the NORTON Automatic Wheel Balancer brings new advantages to wheel balancing for maximum precision grinding. For further details, see your Norton man, a Trained Grinding Engineer. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. *District Offices:* Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

**NORTON**
**MACHINE TOOLS**

*75 years of . . .* Making better products . . . to make your products better

**MACHINE TOOL DIVISION:** Grinding and Lapping Machines — **G & E DIVISION:** Shapers • Gear Cutting Machines • Gear Induction Hardeners



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your products, parts, caps, containers, etc. with the—

## ACROPRINTER®

Tedious hand filling, messy spraying and sloppy applications of color . . . are eliminated when you use the ACROPRINTER®. We make a flexible die of ACROPRENE® to exactly match the cavity, depression and contour of your part or product, then set it in the ACROPRINTER® No. 301 or No. 401A . . . making your color filling operation a high production mechanical one that applies printing ink or enamel precisely and attractively.
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# CALENDAR

**OF COMING SHOWS AND MEETINGS**

Automotive Electric Association, 43rd Annual Meeting and 24th Annual Mfg.-Dist. Conference, Chicago .....Dec. 2-9

Industrial Building Exposition and Congress, New York .....Dec. 12-15

**1961**

Society of Automotive Engineers, International Congress and Exposition, Detroit .....Jan. 9-13

Instrument Society of America, Winter Instrument-Automation Conference & Exhibit, St. Louis Jan. 17-19

29th Annual Meeting, Institute of the Aeronautical Science, New York .....Jan. 23-25

12th Annual Plant Maintenance & Engineering Show, Chicago Jan. 23-26

Society of Plastic Engineers, Inc., 17th Annual Technical Conference, Washington, D. C. ..Jan. 24-27

The Society of the Plastic Industries, Inc., 16th Reinforced Plastic Div. Conference, Chicago .....Feb. 7-9

American Foundrymen's Society, Wisconsin Regional Conference, Milwaukee .....Feb. 9-10

American Society of Mechanical Engineers, Gas Turbine Power Div., Co-Sponsored by the Dept. of Defense, 6th Annual Gas Turbine Conference & Show, Washington, D. C. .....Mar. 5-9

Instrument Society of America, 11th Annual Conference on Instrumentation for the Iron and Steel Industry, Pittsburgh..Mar. 8-10

The Steel Founders Society of America, Annual Meeting, Chicago .....Mar. 11-14

American Society for Metals, Western Metal Exposition, Los Angeles .....Mar. 20-24

Spring Technical Meeting, Pressed Metal Institute, New York..Mar. 22-24

American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York .....May 22-26

International Institute for Welding Meeting .....Apr. 10-15

American Welding Society, 42nd Annual Convention and Welding Exposition, New York..Apr. 10-21

65th American Foundrymen's Society Exposition, San Francisco .....May 8-12


YOU CAN DEPEND UPON **PM**

## EXTREMELY HIGH PRECISION VOLTAGE REFERENCE SUPPLY ... THE PVR-10

**Eliminates dry cells, standard cells and standardization circuits in recording, measuring and controlling instruments.**

The PVR-10 offers an extremely stable output under varying line voltage conditions It eliminates dry battery-standard cell voltage reference systems, using long-life solid state regulator. The PVR-10 is also low in noise and perfect for use with high sensitivity instruments and has high temperature operating-stability. It's life is unaffected by any temperature the instrument will withstand. Use with potentiometer-type recorder-controllers; Leeds and Northrup, Brown, Minneapolis Honeywell and others.

**$89.50** F.O.B. DETROIT

SPECIFICATIONS

**OUTPUT:** 1.050 volts adjustable ± 0.04V.
**STABILITY:** Within 0.08% with simultaneous variations of 107 to 127 volts, 48 to 64 cycles and temperatures of 16° C to 75° C.
**NOISE:** Less than 0.0013% ripple at 60 cycles and 0.0007% at 120 cycles. Less than 0.075 gauss magnetic field at 60 cycles of any phase and in any direction.
**ISOLATION:** Leakage less than 100 picoamperes D.C. from output to ground and less than 20 nanoamperes A.C. from output to ground with unit operating. Will withstand 2000 volts rms between input and output and/or ground.

## THE STANDARD MODEL CVR-610

has become a very popular replacement for the dry battery in instruments retaining the standardizing circuit.

SPECIFICATIONS

**OUTPUT:** 1.5 volts D.C. nominal will supply either 6 or 10 MA circuits.
**STABILITY:** Within 0.1% with line variations from 105 to 125 volts, 50 to 60 cycles.
**NOISE:** Injects less than 10 microvolts into standard measuring circuits.
**TEMPERATURE:** Minus 20 to +140° F.

**$62.50** F.O.B. DETROIT

*PM produces instruments to measure: LOAD • THRUST • TORQUE • FLOW WEIGHT • TEMPERATURE • DISPLACEMENT VOLTAGE • PRESSURE with the highest accuracy attainable in industrial and laboratory applications.*

PM

**PERFORMANCE MEASUREMENTS COMPANY**
**15120 THIRD AVE.**
**DETROIT 3, MICHIGAN**

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# Armco ZINCGRIP Steel Seals Out *Rust*

**Workable, zinc-coated sheet steel offers practical solution to corrosion of body parts.**

Armco ZINCGRIP® Steel is *made* to serve where corrosion of sheet steels causes poor appearance or loss of strength. Automotive body panels and interior body parts are good examples.

ZINCGRIP is workable, too. You can draw, form, bend, punch, pierce. Its full-weight coating of zinc *stretches* with the base metal, does not flake or peel during the severest fabrication, and ZINCGRIP is weldable, too.

For almost a quarter-century, corrosion-resisting parts have been made from this special Armco Steel. For additional information, just fill in and mail the coupon or call your nearest Armco Sales Office.

New steels are born at Armco

**ARMCO STEEL CORPORATION**
1820 Curtis Street, Middletown, Ohio
Send more information on Armco ZINCGRIP Steel.

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Title _____

Firm _____

Street _____

City _____ Zone _____

State _____

Use the STEELMARK to identify high-quality steels in the products you make.

Galvanized Steel

## ARMCO STEEL

ARMCO

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

# WHICH NEW GEAR PROCESS WILL YOU HELP CREATE

Every new gear production process "we" pioneered in the last 3 or 4 decades—and there have been many—had its origin as a problem faced by one or more people like yourself—men who recognized the existence of a problem and came to Michigan Tool for the answer.

Lets go back to 1925 when automobile transmissions were so noisy that drivers couldn't hear themselves think over 30 miles an hour. Sales complained to management, management to engineering, engineering to manufacturing. They finally came to us and we put our engineers and research laboratory to work. You know the answer—gear shaving and the equipment that made quiet gears practical and economical.

Since those days, "Gear Production Headquarters" has poured out a steady stream of answers to the problems of men like yourself—answers like Shear-Speed gear shaping to make the cutting of toothed parts possible at high speeds; Roto-Flo cold rolling of all kinds of splines, threads and grooves in seconds instead of minutes—stronger and better than if machined; optical sine-line gear checking for either laboratory or on-the-floor control; Gear-O-Mation devices for automatic parts handling in process; double enveloping gearing to carry bigger loads with smaller gears; Ultra-Speed hobbing; hard gear finishing; giant shavers and hobbers to turn out gears up to 20 feet in diameter to almost unbelievable precision toler-

**Michigan Tool Company**

Circle 111 on Inquiry Card for more data

?

ances to make ship drives quiet to protect against submarines; grinding equipment to make even "spherical" gears.

To make some of the new processes work even better we created new tools, new coolants; new plastics for gear hones, indexing tables which divide a circle into 5 million parts accurate to a fraction of a second; even text and reference books to make gear designing easier.

You too must have a problem . . . large or small . . . about processes, machines or even tooling. Perhaps our experience has already provided the answer. If we don't have it, we'll go to work on it. Chances are we'll come up with it as we have so often before. It's worth trying and *your* Company will benefit.

**7171 E. McNICHOLS ROAD • DETROIT • TW 1-3111**

Plants in: Detroit, Traverse City and Manistee, Mich. and Windsor, Ontario.

**Gear Production:** The most complete line of equipment for gear production offered by any manufacturer.

Hobbers and Shapers for Job Lots
High Production Hobbers
Shear-Speed Gear Shapers
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Shavers for gears of ½" to 200"
Internal and External Form Grinders
Sine-Line Gear and Tool Checkers
Gear Chamfering Equipment
Abrasive Gear Finishers
Mitco Quality Gear Cutting Tools

**Automation Equipment** (Gear-O-Mation Division): Engineering and manufacture of simple and practical equipment for automating a plant, a line, or a machine. Pre-engineered units for orienting, storage, loading, unloading, assembling, conveying, escapements, positioning, elevating, feeding.

**Form Grinding** (Gear Grinding Machines Division): "Detroit" fully automatic form grinders for both external and internal contours—involute, cycloidal, spherical, straight sided.

**Prototype Gearing** (Enterprise Division): Spur, helical, bevel gears and splines for prototypes and in developmental quantities. Also contour form grinding, internal and external.

**OTHER MICHIGAN TOOL DIVISIONS INCLUDE:**

Cone-Drive Gears Division (double-enveloping worm gears, speed reducers, gear motors); Michigan-Lorenz Division (hobbers and shapers); Shear-Speed Chemical Products Division (coolants and cutting oils); Colonial Tool Co. of Canada Ltd. (cutting tools of all types).

**KNOW YOUR ALLOY STEELS . . .**

*This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.*

# Determining the Depth-Hardness of Alloy Steels

The hardenability of an alloy steel is usually measured by the depth to which the steel will harden under specific conditions of heating and cooling. One of the most conclusive methods of determining depth hardness is the end-quench hardenability test (ASTM A255). In essence, this test is as follows:

A 1-in. round specimen, approximately 4 in. long, is heated uniformly to the proper quenching temperature. The specimen is removed from the furnace and placed in a bracket; then a jet of water at room temperature is played on the bottom face of the specimen without touching the sides. This water jet is kept active until the entire specimen has cooled. Longitudinal flat areas are ground on opposite sides of the piece, and Rockwell C readings are taken at 1/16-in. intervals. The resulting data are plotted on graph paper, with the Rockwell C values as ordinates and distances from the quenched end as abscissae.

Experiments have shown that the points on the hardenability curve approximate the cooling rates at the centers of quenched rounds of various sizes; and that the hardness values at the centers of these rounds will correspond very closely with those shown at points on the end-quench hardenability curve.

In general it may be said that when end-quench curves for different steels approximately coincide, these steels can be treated similarly for equivalent tensile properties in sections of the same size.

A study of hardenability curves reveals that depth-hardness depends upon the amount of carbon present, the alloy content, and the grain size. Manganese, chromium, and molybdenum are the chief elements that promote depth-hardness, while nickel and silicon help to a lesser degree. It should be noted, also, that phosphorus promotes depth-hardness, while sulphur has a negative effect. In normal low-phosphorus and low-sulphur steels, the two elements neutralize each other.

*This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.*

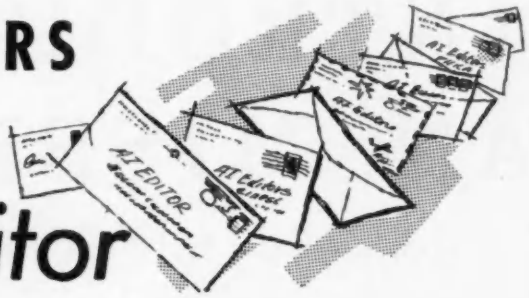
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

*Export Sales:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

Circle 112 on Inquiry Card for more data

# LETTERS to the Editor




Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

## RETARDERS

I have read with great interest article entitled "A Look at Off-Highway Trucks," published in the Sept. 15 issue of AUTOMOTIVE INDUSTRIES. Of special interest to us was the comment concerning the use of retarders on large off-highway haulers.

We would appreciate any elaboration you could make on this potential market.

**Don Bach**
**Research Planning Unit**
**Eaton Research Center**
**Eaton Manufacturing Co.**
**Cleveland, Ohio.**

● *The requirement was stated at the Earthmoving Conference, Peoria, Ill., on April 5 and 6. —Ed.*

## RELIABILITY & QUALITY CONTROL

In the November 1st issue of AUTOMOTIVE INDUSTRIES "Letters to the Editor" section indicates that a booklet on reliability and quality control has been published by yourselves. This booklet apparently mentions AC Spark Plug. Accordingly, we would appreciate being furnished with three copies of this booklet. If there is charge for this, please submit invoice which will be honored promptly.

**Harold S. Sharp**
**Technical Librarian**
**AC Spark Plug**
**Milwaukee, Wis.**

In the "Letters to the Editor" section of AUTOMOTIVE INDUSTRIES for November 1, I see two references to a booklet on reliability and quality control.

Did I miss it? Has it been released only on a limited basis?

How can I procure a copy?

We're scurrying to ensure "top quality" of engines for Ford's HD series described on page 51, November 1 issue.

I enjoy the variety of really worthwhile articles in AI. Pretty darn good descriptive advertising too.

**Joe Grott**
**Supervisor of Quality Engineering**
**Cummins Engine Co.**
**Columbus, Ind.**

Will you kindly send me three or four additional copies of your technical publication on the field of reliability and quality control?

**William P. Youngclaus, Jr.**
**American Society for Quality Control**
**Milwaukee, Wis.**

● *To Messrs. Sharp and Grott, the QC booklet is a complete 64 page engineering report and compendium. Price is $2.00 each.—Ed.*

## PAGEANT OF NEW CARS

I was very pleased to receive my copy of the October issue of AUTOMOTIVE INDUSTRIES magazine. It is a most interesting, informative and beautiful issue.

As a Councilor and member of the Automotive Division of ASQC, I can readily see that you believe in only top quality products and clearly presented facts and information.

**J. Y. McClure**
**President**
**American Society for Quality Control**


TO MEET YOUR REQUIREMENTS

STANDARDIZE 100% ON Southern FASTENERS

Just name your fastener requirements. Chances are that the screw or bolt you need now is in Southern Screw's stock of 1,500,000,000 pieces—and in the exact size, head style, material, and finish you want. If special plating is one of your requirements, Southern has its own plating department.

Perhaps price is a big factor. Remember; in the final analysis, the best cost less. Southern fasteners are the best you can buy.

See for yourself how USA-made Southern fasteners can meet your requirements. Get in touch with your nearest Southern Screw distributor, or write Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

Manufacturing and Main Stock in Statesville, North Carolina

WAREHOUSES:
New York • Chicago • Dallas • Los Angeles

Machine Screws & Nuts • Tapping Screws • Stove Bolts • Drive Screws • Carriage Bolts • Continuous Threaded Studs • Wood Screws Hanger Bolts • Dowel Screws •

Southern SCREW COMPANY STATESVILLE • NORTH CAROLINA

Circle 113 on Inquiry Card for more data

# SPICER INTRODUCES NEW TRANSMISSION!

## Extra-Heavy-Duty 8000 Series Direct on 5th

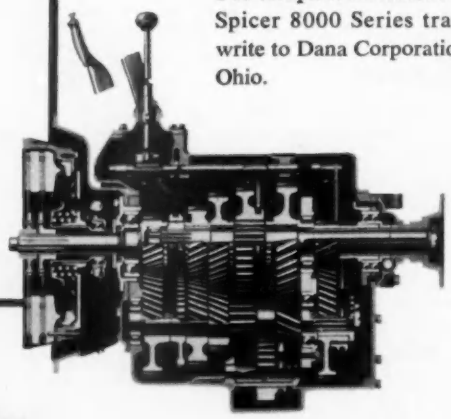
Here is the extra-heavy-duty transmission that truck fleet operators have demanded! The new Spicer 8000 Series 5-speed transmission is the largest capacity direct-on-fifth transmission on the market. It is designed primarily to complement big diesel engines.

With the new 8000 Series Spicer transmission, top vehicle speed is obtained in direct drive. Ratios of the new transmission are spaced so that they are functionally split or compounded with ratios of 2- and 3-speed axles and 3- and 4-speed auxiliary transmissions. Spicer 14" 2-plate and 15½" 2-plate clutches are matched to work at top efficiency with this new 8000 Series unit.

**Ratios in the standard 8052 (iron case) and 8054 (aluminum case) and the optional 8052-A and 8054-A are:**

| RANGE | STANDARD MODELS 8052 and 8054 | OPTIONAL MODELS 8052-A and 8054-A |
|---|---|---|
| 1st | 7.30 to 1 | 5.68 to 1 |
| 2nd | 4.54 to 1 | 3.13 to 1 |
| 3rd | 2.75 to 1 | 1.71 to 1 |
| 4th | 1.65 to 1 | 1.29 to 1 |
| 5th | 1.00 to 1 (direct) | 1.00 to 1 (direct) |
| Reverse | 7.00 to 1 | 5.47 to 1 |

**NOTE:** The 8031 and 8035 Series Spicer auxiliary transmissions have been augmented by a new underdrive ratio of 1.19 to 1 to better complement the ratios of the new Series 8000 direct-on-fifth transmissions.



For complete information on the new Spicer 8000 Series transmissions, write to Dana Corporation, Toledo 1, Ohio.

DANA Spicer

**DANA CORPORATION**

Toledo 1, Ohio

**SERVING TRANSPORTATION**—Transmissions • Auxiliaries Universal Joints • Clutches Propeller Shafts • Power Take-Offs Torque Converters • Axles • Powr-Lok Differentials • Gear Boxes • Forgings • Stampings • Frames • Railway Drives

Many of these products are manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario



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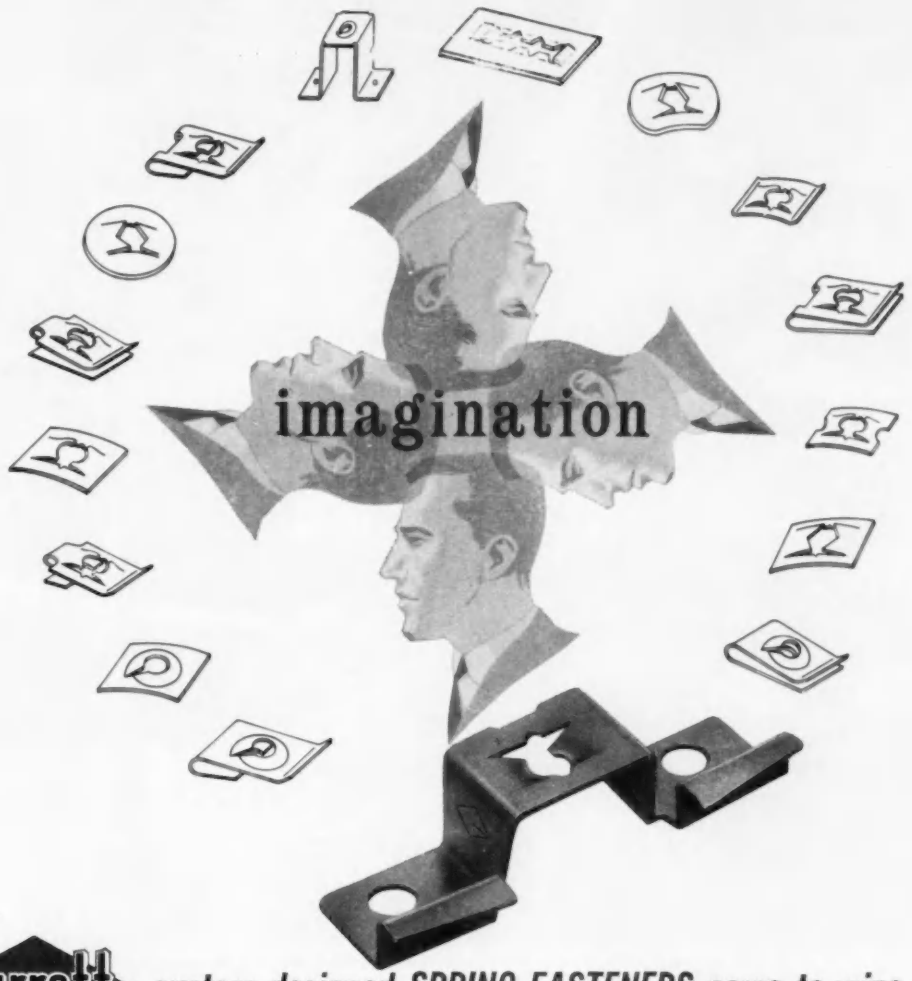


Garrett OF PHILADELPHIA

## *custom designed SPRING FASTENERS come to grips with those tough problems*

Of course you'll want more than just imagination when you need a spring fastener designed for your product. You'll want a thoroughly dependable source . . . you'll want consistently high quality . . . you'll want on-schedule delivery . . . you'll want superior service!

For complete satisfaction from design to delivery . . . consult GARRETT of Philadelphia . . . since 1933 the House of Superior Service.

**AT GARRETT:**

- Skilled, imaginative engineers expertly design special fasteners of unusual design for O.E.M. applications.
- Special design samples are available promptly from our Research and Development Department.
- Flat nuts, "J" nuts and "U" nuts are stocked in ample quantities and sizes, both cone and twin-prong impressions; also rectangular and round push-on nuts.
- Quality is rigidly controlled . . . at every step . . . using the most precise techniques.
- Every manufacturing step is performed in the GARRETT factory . . . under one roof. Nothing sub-contracted . . . no divided responsibility.

**For further information, write GARRETT . . . THE MOST COMPLETELY INTEGRATED PLANT IN THE INDUSTRY.**

Garrett SPRING FASTENERS

# GEORGE K. GARRETT COMPANY, INC.

**8879 TORRESDALE AVE., PHILADELPHIA 36, PA.**

**OTHER QUALITY PRODUCTS BY GARRETT**

helical spring lock washers

flat washers

stampings

hose clamps

spring washers



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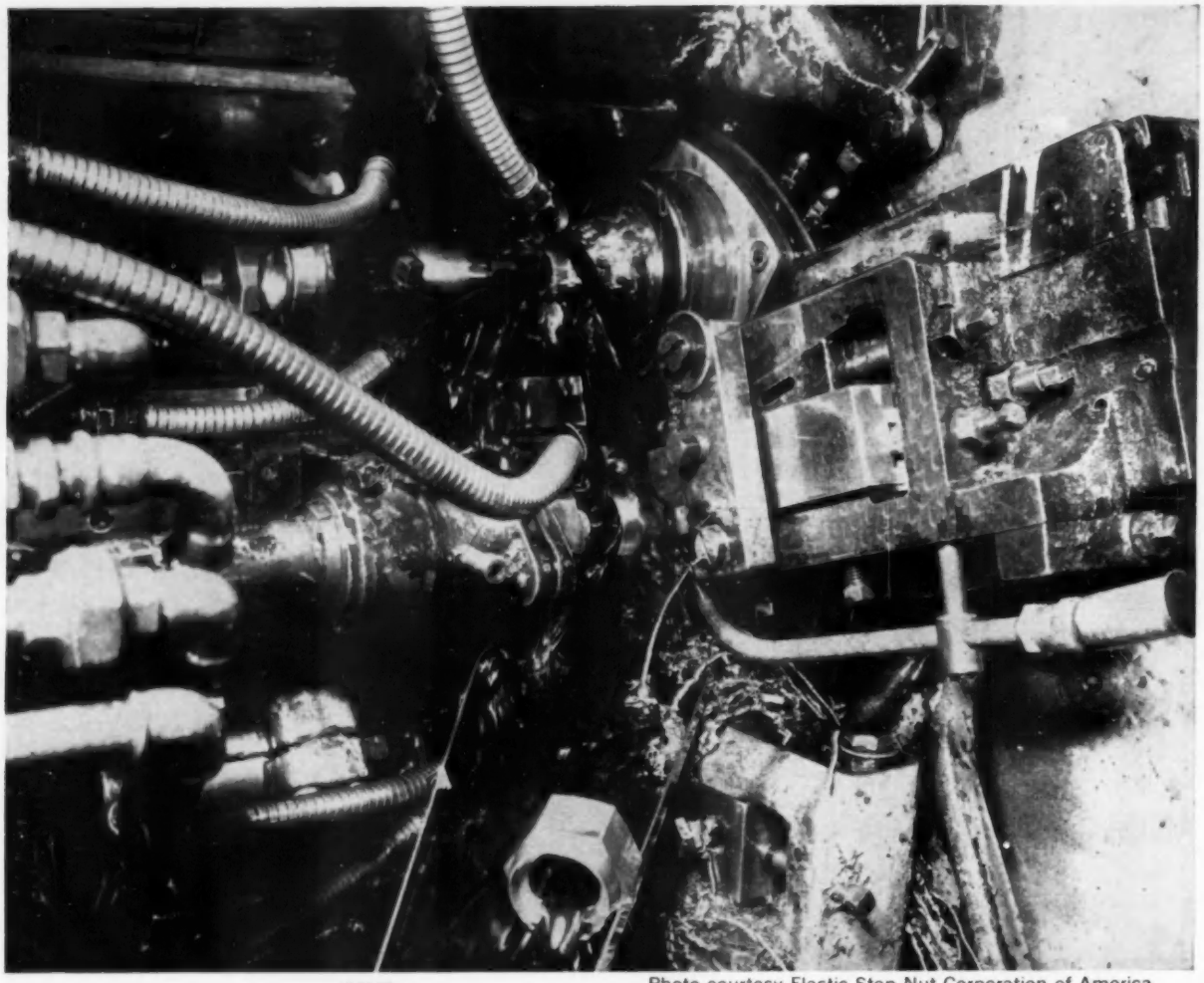


Photo courtesy Elastic Stop Nut Corporation of America

# Nuts . . . ESNA makes millions of them from Aristoloy Electric Furnace Steel

Steel for self-locking hex nuts must be uniform in structure, easy to machine and free from internal and external defects. Elastic Stop Nut Corporation of America insists on these qualities . . . and gets them with Aristoloy cold finished bars.

Aristoloy Electric Furnace Steels, carefully controlled from melt shop to finishing operations, meet specifications for this and other applications requiring steel of uniform quality.

For complete information about Aristoloy blooms, slabs, billets and bars, in carbon, alloy, stainless and leaded, call the Copperweld representative in your nearest large city . . . or write for NEW PRODUCTS & FACILITIES CATALOG.

ARISTOLOY STEELS

DIVISION OF
COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.



Circle 116 on Inquiry Card for more data

# NEWS

Vol. 123, No. 11 Dec. 1, 1960

# 6.8 Million Sales Seen

## Analyst Cites Strength in '61 Market

**By C. B. Campbell, News Editor**

Total 1961 demand for new automobiles should push up to at least 6.8 million units compared to this year's estimated 6.6 million sales.

This is the prediction C. V. Horky, chairman of the American Petroleum Institute's Committee on Statistics, made at the 40th annual API meeting in Chicago.

"There seems to be basic strength in the new car markets," Mr. Horky told his audience. "October's record sales pace certainly gives the industry an auspicious start on its new model year. Total 1961 demand should push up to at least 6.8 million units.

"In terms of gross national product, the most complete measure of the economy's performance, next year's gain over 1960 should approximate 3.4 per cent—topping the $520 billion level. Rising outlays by consumers and the government will produce this advance—an advance slow and orderly enough to restrict the price rise to possibly one per cent—even though, as just mentioned, the upward pressures on prices may increase substantially as the year progresses.

### Interest Structure

"As for credit and interest rates, we don't see how the interest structure can drop below its present level without further undermining our international financial position—a factor the new administration will be forced to consider, regardless of how it may clash with wild campaign promises on spending and easy money."

Mr. Horky, of the Analysis and Statistical Department of the Pure Oil Co., continued "Since we feel that the net balance of forces—economic and otherwise—indicates a fourth quarter pickup in final demand, we likewise expect moderate industrial growth during all of 1961—save possibly the first month or two, when lags may still be working themselves out. It should be a better business year than 1960 in the sense—too—that the business tempo will be undergoing improvement most of the year, whereas it remained static for much of 1960.

"Several more months of adjust-

### CHRYSLER 300G HAS 375-HP ENGINE

**Seventh in a series, the 1961 300G sports touring car has standard ram induction engine and heavy duty TorqueFlite automatic transmission. New this year, at extra cost, is a three-speed manual transmission and floor mounted gear shift lever. Chrysler calls it America's most powerful production car.**

ment appear somehow inconsistent with the gradual nature of this year's adjustments so far. For this reason—we feel it much more likely that the fourth quarter will produce some improvement in consumer buying—the start of orderly and durable expansion. Expansion is natural—in the absence of inhibiting factors—and such factors simply do not now exist in force.

"In short—'we're from Missouri,' —we simply are not quite convinced of the relevance—today—of much of the cycle analysis being voiced currently — analysis using, primarily, our three post-war business cycles as precedents — and producing, for the most part, rather bleak views of 1961."

## Minuteman Work

The Allison Div. of General Motors is building second-stage rocket motor cases for the Minuteman intercontinental ballistic missile under a development contract from Aerojet-General Corp.

First-stage rocket motor cases for Minuteman have been produced for some time under contract to Thiokol Chemical Corp. These cases have achieved a 100 per cent reliability record in repeated test firings.

## Chrysler Changes Due?

The long-expected death of the De Soto passenger car last month pointed to further organizational changes at Chrysler Corp., with the merger of Plymouth and Chrysler-Imperial Divs. as a reported possibility.

Months before Chrysler officially cut off De Soto production, rumors of a Plymouth-Chrysler merger were circulating. With De Soto out of the way, the path would now be clear. Already, some former De Soto dealers, who also handle Plymouth, have been given the Chrysler franchise.

A merger of this sort would involve mainly sales, advertising, administrative, product planning and related activities, since none of the corporation's sales divisions has any hand in manufacturing or assembly. As at Ford Motor Co., all plants are centrally directed.

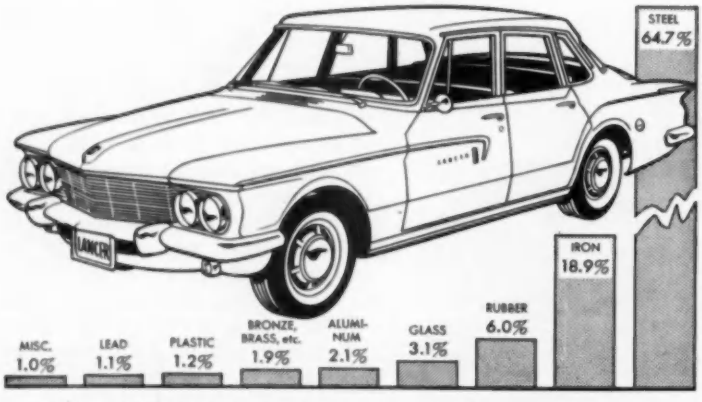
Continuation of Chrysler's centralization trend seems to bear out the merger rumors. More operations once performed at division level are being transferred to Highland Park. Certain finance functions, for example, are now in the process of being centralized.

One result of this centralization program would be more streamlined sales divisions, making them more adaptable to merger.

Chrysler may have tipped its hand last summer when it announced the new lower-priced Newport series in the Chrysler line. The Newport was priced right alongside the one remaining De Soto model as a "medium priced" car.

But all was not gloom at Chrysler. De Soto's end was not unexpected, in view of the poor sales record of the last four years. And as proof that the Chrysler Newport was a satisfactory replacement for De Soto, the corporation simultaneously announced that all production workers at the Jefferson plant in Detroit would be retained to work on the Newport, Windsor, New Yorker and Dodge Polara.

What is a car made of?




Steel is still the major material in the modern car, accounting for almost two-thirds of the weight. The percentages of other materials used in this typical compact, a Dodge Lancer, are shown in the drawing above.

## Production Slowed By High Inventories

To borrow the title from Tennessee Williams' new Broadway play, the automobile industry has been going through a "Period of Adjustment." Car makers have been adjusting their production schedules to put inventories in line with sales, as the saying goes.

The industry began the 1961 model year with larger than usual field stocks. As a result, some cutbacks have been made to let sales catch up with production.

Robert S. McNamara, in his first press conference the day he was elected president of Ford Motor Co., admitted candidly that inventories of unsold 1960 Fords were "more than we would have considered optimum." This, he explained, was the result of errone-

ous reports at the beginning of the summer from both dealers and company people.

But October sales were good, he added, and the inventory situation was straightening itself out. He also said that all signs point to Ford beating Chevrolet in '61 model sales.

At Chrysler Corp., production in the third quarter was intentionally high, the company admits, because Chrysler feared there would be severe results from the fall railroad strike. Consequently, the company "borrowed" from fourth quarter production, and schedules have been cut back to balance the field supply. The company has laid off 6400 production workers since '61 model runs began, and three assembly plants — Dodge main, Dodge truck and St. Louis— were down Thanksgiving week.

Studebaker-Packard announced tentative plans to cut its work force by "at least" 1000 the early part of December.

Through Nov. 19, 5,986,618 passenger cars, 1,079,775 trucks and 3730 buses were produced this year. In the same period last year, the figures were 5,044,955 passenger cars and 1,035,414 trucks and buses.

In the week ending Nov. 19, 149,-898 passenger cars were produced. This was 11,067 more than in the previous week.

## Citroen-Simca Pact

In a move aimed to further increase its manufacturing capacity, S. A. Andre Citroen has signed an agreement with Simca for the use of Simca's automotive production facility in Nanterre, France.

According to this agreement, Simca has put the entire plant at Citroen's disposal. This arrangement, in turn, will permit Citroen to expand its present level of manufacturing.

Presently, Citroen plans to produce approximately 320,000 vehicles this year.

In addition, Citroen is building a plant near Rennes, France. When completed in early 1962, it will be one of Europe's largest automotive plants and will employ about 5000.

## Gerstacker Heads Dow

Dr. Carl A. Gerstacker, 44, has been elected chairman of Dow Chemical Co. He succeeds Dr. Earl W. Bennett, 80, retired chairman, who remains as a board member and finance committee member.

## Four-Door Monza

Chevrolet will add a four-door Monza to its Corvair line beginning in January to supplement the two-door model introduced last June. The Monza currently is taking 30 per cent of total Corvair production, indicating that even in the compact car market, customers are more interested in luxury than in price economy.

Edward N. Cole, Chevrolet general manager, said in announcing the new model that the reaction to the Monza sports coupe has demonstrated there is a sizeable market for luxury models of the new, smaller cars. The four-door version was unveiled at the GM Motorama in New York early last month.

**NEW CITROEN CONVERTIBLE AT PARIS SHOW**

**Built on strengthened underframe, Citroen DS 19 convertible has two-door body built by Chapron. New model is available in 13 body colors and will be marketed early next year. Like DS 19 sedan, it is powered by 75 hp engine driving the front wheels and features hydro-pneumatic suspension.**

# NEWS

CONTINUED

## NATO STUDIES ALVIS STALWART PROTOTYPE

**Military six-by-six recently demonstrated to Supreme Allied Commander in Europe has all-independent suspension. A Rolls Royce 220-hp gasoline engine provides top speed of 54 mph. For amphibious operations, Alvis plans water-jet turbo units that will give a surface speed of five knots.**

## Warns of Planners

Excessive business concentration on frivolous and meaningless changes in consumer goods increase the danger of economic planning that would decide for business and the consumer what kind of goods could be made and sold.

This was the warning of George Romney, president of American Motors Corp., in an address to the American Society of Industrial Designers in Chicago.

"Externally, we are certainly facing heightened European economic competition," Mr. Romney said. "European products are becoming more evident; Asiatic products are beginning to play a part; we know that we are going to face a strengthened Russian economic challenge as we move forward. We also recognize that the bulk of the world's population is dependent on technical and other assistance to help them in their economic development. The part we play in that will importantly determine the future of our country and of the world.

"We do not need economic planners. No matter how virtuous their purpose, they would stifle economic growth and progress. They should never be granted the power to decide what American consumers ought to want and ought to buy. This has been the sorry plight of most economies in man's history and as a result they have been economies of scarcity, not abundance."

## 24-Month Warranty

Ford Motor Co. has increased the warranty period on the 1961 Lincoln Continental to 24,000 mi or 24 months, whichever comes first. Other 1961 cars are warranted for 12,000 mi or 12 months.

The new Lincoln Continental went on sale on Nov. 17 with suggested list prices of $5565 for the four-door sedan and $6166 for the convertible. The sedan price is $471 under the 1960 Continental four-door. The new convertible price is $65 less than last year's two-door model.

The new Thunderbird carries a suggested list price of $3812 for the hardtop and $4246 for the convertible, a slight increase over last year. But Ford Div. has included, as standard equipment on the '61, power brakes and steering, back-up lights, electric windshield wipers and dual-range automatic transmission.

## AMC Extends Rebate

American Motors Corp. has extended its employe rebate program on new car purchases to workers at the Budd Co. plant in Gary, Ind. Budd is an AMC supplier.

The offer was made by George Romney, AMC president, at dedication of an expanded plant in Gary. Under the plan, the worker buys a car from a dealer where he can get the best deal. He then takes an invoice or bill to Budd and it is forwarded to AMC.

AMC will rebate $75 to each Budd employe, plus the tax that would be due. Mr. Romney said the actual rebate would be close to $100.

## Lockheed Contract

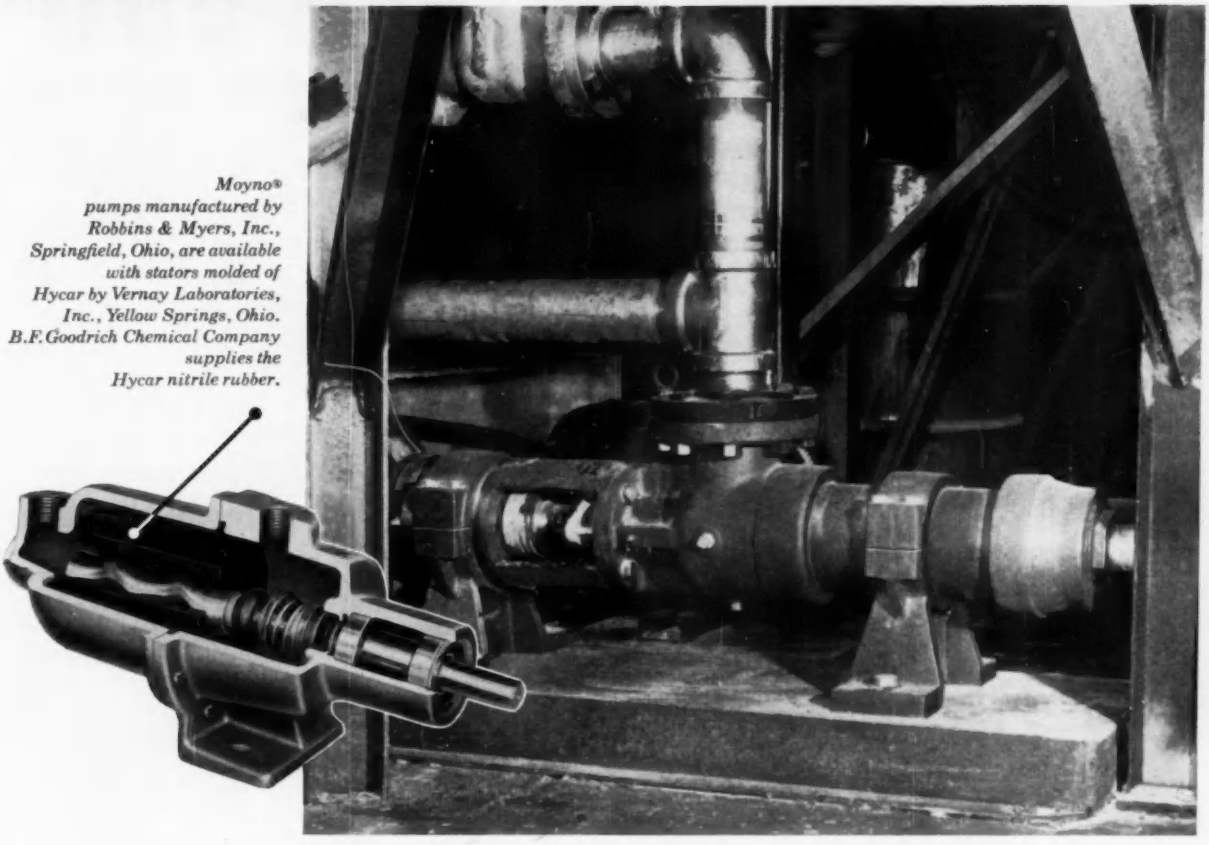
Lockheed's California Division has reported receipt of a $53 million contract from the U. S. Navy for additional turboprop P3V-1 anti-submarine warfare planes.

The new order increases the total value of production work now scheduled on the advanced sub-killer to $126,836,691.

M. C. Haddon, Lockheed vice president and California Division general manager, said this latest contract assures production of the P3V-1 through the end of 1962.

***Another new development using***

# B.F.Goodrich Chemical *raw materials*



*Moyno® pumps manufactured by Robbins & Myers, Inc., Springfield, Ohio, are available with stators molded of Hycar by Vernay Laboratories, Inc., Yellow Springs, Ohio. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.*

## STATORS OF HYCAR RUBBER
## help pumps handle corrosive jobs

The manufacturer of these pumps says they handle "anything that flows through piping." When the going gets unusually corrosive or abrasive, stators made of Hycar nitrile rubber are used.

The Hycar stators are made in varying hardnesses—rigid for handling some materials, flexible for others. Any corrosive or abrasive material may call for Hycar stators; this pump manufacturer particularly recommends it for petroleum solvents and oils, vegetable oils, alcohols, all salt solutions, mild acids and corrosive liquids.

Hycar gives long-term service in an application like this because of its resistance to chemicals and corrosion that would destroy ordinary rubber. Hycar can be accurately molded into the complex double internal helical design of this pump's stator.

Here's another example of the way that Hycar nitrile rubber helps products find new applications, or helps develop new products. For information, write Dept. FL-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**Hycar**
REG. U.S. PAT. OFF.
*Rubber and Latex*

**B.F.Goodrich Chemical Company**
a division of The B.F.Goodrich Company

**B.F.Goodrich**

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers



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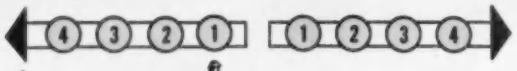
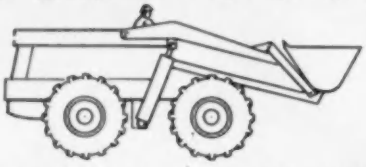
# only the HYDRA-DRIVES® BDB

## OFFERS ALL THESE MAJOR ADVANTAGES

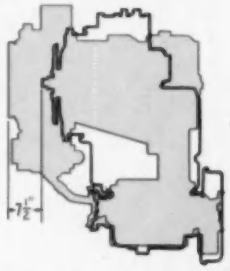
**IN FULL-POWER SHIFT TRANSMISSIONS for equipment up to 175 h.p.**



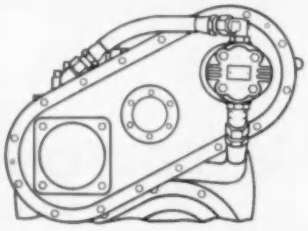

1. **4 speeds forward and reverse.** All power shifted. Provides maximum horsepower to load under all load conditions.



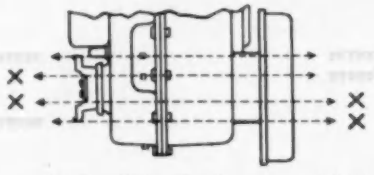
2. **Integral design.** Torque converter, transmission, oil passages, valving and oil sump are in *one* compact housing—7½" shorter than comparable models.



3. **Triple pump drives** — Allow implement and steering booster pumps to be installed close to the oil reservoir. Installation and maintenance costs are reduced. Single pump drive is also available.



4. **Full disconnect** provides four combinations of split drive . . . from torque on both shafts, to both shafts in disconnect.



**DESIGNED FOR SPECIALIZED EQUIPMENT**

Rockwell-Standard's new model Hydra-Drives Full Power Shift Transmission is designed for specialized equipment, such as front end loaders, fork trucks, scrapers, crane carriers, rubber tire tractors and military vehicles.

The Hydra-Drives BDB offers easier servicing and maintenance. There are fewer moving parts and bearings. The simple, rugged countershaft design and spur gears simplify maintenance.

A larger CBD Transmission is also available for equipment up to 250 H.P.

*Another Product of...*

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ROCKWELL R STANDARD®

Transmission and Axle Division, Detroit 32, Michigan



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# NEWS

## FEATURES

# Ford's Overseas Moves

## Will Buy Subsidiary, Increase Spending

Ford Motor Co., long a big operator in the world automotive market, has announced two moves aimed at strengthening the company's overseas business. The company plans to increase substantially its capital and expenditures for new tooling and facilities in foreign countries, and to purchase the outstanding stock in its English subsidiary, Ford Motor Co., Ltd., of Dagenham.

Henry Ford II revealed the increased spending in his first official statement after relinquishing the presidency to Robert S. McNamara. He said the company plans to spent $220 million abroad during 1961 for tooling and facilities, a sizeable jump from the $138 million allocation for 1960. He declined to break down the figure, but indicated the bulk of it would go to European operations.

"European business is becoming more and more important every year, bringing in more money for the company," he explained. He added that this phase of the company's operations will receive much more emphasis than in the past.

Ford Motor Co. later made an offer to purchase all outstanding shares of stock in its English subsidiary—about 17.7 million shares —at $20.50 a share. Ford now owns 54.6 per cent interest in the giant Dagenham operation, and is willing to pay $360 million for the balance.

The objective, as explained by board chairman Ford, is to "obtain greater operational flexibility, and enable Ford better to coordinate European and American operations on a world-wide basis." If Ford is successful in achieving greater operational efficiency and marketing effectiveness in both countries, he said it would mean a product and cost position which should result in more effective competition throughout the world.

### New English Plants

Ford currently is in the midst of a three-year $196 million expansion program in England, which will be completed by the end of 1962. Included are new plants at Liverpool and Basildon.

The stock purchase offer was a bombshell in England. Ford stock jumped more than $6 on the London market the first day, opening at the equivalent of $12.88 a share and closing around $19. The deal would cost Ford Motor Co. about $360 million, with roughly $300 million going to British shareholders and

(*Turn to page* 25, *please*)

### STUDEBAKER OFFERS MODEL FOR SUN LOVERS

**The Skytop Sunroof is available on all 1961 Lark sedan and hardtop models. Lark is the only American-made auto to offer the Skytop.**

# AI TABLOID

Two Air Force reports on research on semiconductor devices, one of which describes the development of a radiation-resistant diode, have been published. Also just published is a study sponsored by the Army Signal Corps on "A Practical Interpretation of Dielectric Measurements Up to 100-MC.

* * *

Instead of shipping crude oil from the well to the refinery, it is now possible to bring the refinery to the well. A Kansas company has come up with a miniature truck-mounted refinery that can process about 200 bbl of crude oil a day. It turns out such products as kerosene, Diesel fuel and straight-run naphtha.

* * *

The National Bureau of Standards has developed a method for producing nickel - aluminum alloy coatings capable of protecting metals from oxidation at temperatures up to 1000C. The most durable coating was obtained by electroplating nickel over the basic metal and then plating aluminum on the nickel at 700C.

* * *

The demand for super purity aluminum is increasing, and consumption is expected to more than double in the next five years as new uses for the metal develop. Because of its special physical characteristics, super purity aluminum is finding its way into new fields in electronics, chemical processing, refining of high-octane gasoline, electrical products, optical frames, jewelry and other specialty outlets.

* * *

The deepest wells in 38 of the 39 states in which exploratory drilling has taken place are dry. The lone producer is in Alaska, where the deepest well—more than 15,000 ft—found natural gas. The deepest well in the world was drilled last year in Texas. It cost $3 million and went down almost five mi. Only geological specimens were found.

Results of research on two titanium alloys for use in flight vehicle design have been released to industry and the public.

* * *

The main effects of high temperatures on sliding metal parts are changes in hardness, surface energy, and tensile strength, according to an Air Force-sponsored study of frictional properties of surfaces conducted with a new high-temperature friction apparatus permitting sliding experiments at temperatures up to 2000F.

* * *

An experimental multiple coating for metals, consisting of layers of chromium, silicon, and rhodium, has been developed. It can provide adequate protection for thoriated tungsten at temperatures up to 3000F. Although the present coating is effective only for periods up to 20 minutes, tests show that improved protection is possible provided there is complete diffusion alloying, bonding and melting of the surface coat.

* * *

Machining some high-strength metals at high temperatures makes them easier to work, reduces tool pressures and cutting and, in some instances, increases tool life up to 100 times.

* * *

Manufacturers' shipments of passenger car tires during August amounted to 7,824,458, units, a decrease of 12.23 per cent below the July total. The drop in shipments was due to model changeovers.

* * *

Shipments of 380 business and utility aircraft valued at $8,544,000 during August has been announced by the Utility Airplane Council of the Aerospace Industries Association.

* * *

Six translations of foreign technical literature on aerodynamics and pneumatics have been released for sale to industry through the Office of Technical Services, Business and Defense Administration, U. S. Department of Commerce.

Robert B. McCurry, Jr., has been named general sales manager, Plymouth-De Soto-Valiant Div. of Chrysler Corp.

## Compacts May Boost Use of Plastics

The automobile industry's swing to compact cars is creating new domestic markets for plastics as makers strive to cut costs and weight while maintaining quality, said Earle S. Ebers, vice president and general manager, Naugatuck Chemical Div., United States Rubber Co.

Mr. Ebers said the switch to plastics for functional, as well as decorative, jobs could increase plastic consumption by the auto industry to as much as 30 lb per car during the 1961 model year. In 1960, auto makers used about 21 lb of plastic per car.

## Reynolds Elected

Frank W. Reynolds, manager of International Business Machine Co.'s Plastics Laboratory at Endicott, N. Y., has been elected 1961 president of the Society of Plastics Engineers.

(*Continued from page* 23)

the balance to U. S. investors.

The Ford announcement said the Dagenham operations would continue under the direction of Sir Patrick Hennessy, chairman, with no change in employment policy or development program.

British Chancellor of the Exchequer Selwyn Lloyd announced later that the British government would permit the purchase. He told the House of Commons he believed full American ownership would lead to more vigorous development of the Ford enterprise in Britain.

### Changing Market

This new four-passenger car, perhaps to be known as the Cardinal (see AI, Dec. 15, 1959; May 1, 1960) is an indication of the way Ford interprets the changing world market. The car apparently was conceived as a "world" car, rather than as a German or U. S. vehicle.

In the past, U. S. auto companies have designed products for the domestic market, and then have tried to sell them in export. This method has not worked out in recent years because of the growing size and price of the U. S. cars and because of taxes and fuel costs in foreign countries. U. S. automotive exports, as a result, have suffered.

But Ford does not believe the answer is in a strictly European automobile. Sales of the Anglia in this country have been below expectations, and the company has discontinued importing the Germany-built Tannus to the U. S.

The Cardinal, according to Detroit reports, is being planned in two versions, although the vehicle will be basically the same in both versions. Tooling is being done both in the U. S. and in Germany, and the car probably will be assembled in both countries.

**Robert S. McNamara, 44, is new president of Ford Motor Co.**

Ford has not yet confirmed that the Cardinal will be offered for sale in this country, although the German version is expected to be on the market as a '62 model.

## Sale, Scott Elevated

Ford Motor Co. of Canada, Ltd., has elevated Rhys M. Sale to chairman of the board and Karl E. Scott to president and chief executive officer. Mr. Sale, a 45-year vetern of the company, has been president since 1950. Mr. Scott has been executive vice president since January, 1959.

Mr. Sale, 63, is a native of Windsor, Ont. He joined Ford of Canada as a junior in the cashier's department and worked up through export and sales. He became a director and vice president in 1946.

Mr. Scott, 54, a native of Parry Sound, Ont., was educated at Ypsilanti, Mich., and Detroit, and joined the Ford Motor Co. finance staff in Dearborn in 1946. He later served as general manager of the Manufacturing Services Div. and director of the Organization Planning Office. He joined Ford of Canada in 1959.

## New Ford Division

Ford Motor Co. has set up a new Automotive Assembly Div., divorcing Ford Div. of all responsibility for car and truck assembly. Ford Div. now becomes primarily a sales organization.

The new division includes 17 plants employing 43,000 persons in 12 states.

Denis J. Bracken, formerly general manufacturing manager of Ford Div., becomes general manager of the new division, reporting to J. O. Wright, vice president and group executive-car and truck divisions.

The realignment makes Ford's set-up similar to the Chrysler Corp. plan, where the three vehicle divisions are primarily charged with sales, advertising and related ac-

**Denis J. Bracken**

tivities. Ford took a step in this direction a year ago when the assembly of Lincoln, Comet and Mercury automobiles was taken over by Ford Div.

Mr. Bracken joined Ford in 1953, served briefly as assistant general manufacturing manager of Lincoln-Mercury Div., and took over the division's top manufacturing post later that year. In 1959 he was made assistant general manufacturing manager for the combined manufacturing operations of Ford Div. and Lincoln-Mercury Div., which were centralized in 1959. Last June he was made general manufacturing manager of Ford Div.

Mr. Bracken formerly was vice president and general manager of Motor Products Corp. Before that, he spent 18 years with General Motors.

# Four Companies Emphasize Midget Cars At Record-Setting Tokyo Motor Show

Japan's expanding automotive industry made the 7th Tokyo Motor Show the biggest on record even though only a few new models were presented.

The show was staged in Tokyo's sprawling Harumi Fair Grounds where more than 350 vehicles of all types were on display. For the most part, the showing provided visitors with a chance to compare a cross-section of the industry's output, but showed little more than has already been offered by dealers.

Perhaps as a reflection of the industry's solid approach to sales, there were no flashy promotional efforts with custom-made sports or other experimental vehicles. The mood seemed to be more conservative with an eye towards sales rather than news clippings.

### Prospering Economy

Japan's prospering economy brought increased attention to the 360 cc class of autos which represent the industry's bid for average family sales. An industry spokesman predicted these midget vehicles will assume greater importance in the sales picture as the market for larger cars is filled. He based his statement on the fact that only about eight percent of Japanese autos are sold for private use. The bulk go to commercial outlets—taxi companies, tourist agencies and to industrial organizations. Since there are limits on the number of taxicab licenses issued, this year saw mostly replacement vehicles sold to this market.

Strict limitations on the import of foreign-made automobiles helped the domestic manufacturers sell to industry which, in Japan, provides company-owned cars for all high-ranking executives and for staff transportation.

At the Auto Show, the major manufacturers had only minor style changes on their standards. Toyota Motor Products offered its Corona, Tiara and the Cedrics, which were introduced earlier this year, for the first time. Fuji Precision Products displayed its Prince Skyline series and the Prince Gloria which, with the Cedric Deluxe, are the largest domestic passenger cars. All are four-cylinder cars.

### Emphasize Midgets

Four companies gave major emphasis at the show to their midget cars.

Toyota displayed a prototype of an entirely new four-passenger car that it hopes to have on sale by May, 1961. The vehicle has a two cylinder, four-cycle 700 cc air-cooled engine and is expected to sell for about $1000. This "people's car" is still unnamed and the manufacturer plans a nationwide com-

**AMERICAN HOIST'S NEW CRANE-EXCAVATOR**

**Air-controlled 4½ cu yard crane-excavator has been announced by American Hoist & Derrick Co., St. Paul, Minn. When rigged as lifting crane, it has rated capacity of 110 tons. Several types of booms are available and are alloy steel with tubular lattice construction with pin connecting sections.**

**New Toyopet Corona Five-Passenger Sedan**

petition to find one for it.

Fuji Heavy Industries, Ltd. showed its Subaru 360 series—the commercial, a convertible and a sedan. All have the same two cylinder, two cycle, 356 cc engine.

The Toyo Kogyo Co., Ltd. offered its Mazda R360 coupes, a rakish little four seater with the same sized engine as the Subaru and about the same overall specifications—117.4 in. long, 50.8 in. wide, 50.8 in. high with a 69.3 in. wheelbase.

### New Grille Design

Mitsubishi Reorganized Co. Ltd. showed its "500" midget which was introduced last winter but has had a new grille design. It has a two-cylinder, 493 cc four-cycle engine and is a bit larger than the other midgets.

Another indication of the growing buying power of the average Japanese citizen was the extensive showing of motorcycles and motor bikes. The industry looks to top the one million production mark in 1960 as domestic consumption continues to rise and exports to Europe and the United States hold firm.

During the show, the Automotive Industrial Association released to AUTOMOTIVE INDUSTRIES Japan's production figures for the first eight months of 1960.

Through August, 89,964 cars, 187,182 trucks and 5223 buses were produced—a total of 282,369 units. These car and truck figures exceeded production for all of 1959. Only bus production lags.

Motor vehicle exports continued to climb. Through August, 4058 autos were shipped abroad with 2696 going to the U. S. There were 7518 trucks sent overseas (843 to the U. S.) and 383 buses—none to the U. S.

**Nissan Cedric Deluxe Six-Passenger Sedan**

**Toyota Land Cruiser With Hardtop**

**Six-Passenger Toyopet Crown Deluxe Sedan**

**Toyopet Crown Custom Sedan**

# Specify MECHANICS UNIVERSAL JOINTS for MAIN DRIVES

Manufacturers have found that the slip-on-the-transmission-shaft feature of MECHANICS Roller Bearing UNIVERSAL JOINT reduces lost motion, excessive play, whip and runout to a minimum. This "C" type MECHANICS joint also saves time and money on the assembly line because it has less parts to handle. Give your product the benefits of NEW joint developments. SPECIFY MECHANICS Roller Bearing UNIVERSAL JOINTS for main drives. Let our engineers help you design transmission lines better suited to the low floor board, more powerful engine and higher speed requirements of your future models. Send prints and specifications—for free prompt recommendations.

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**• For Cars • Trucks • Tractors • Farm Implements • Road Machinery •**

**• Aircraft • Tanks • Busses and Industrial Equipment •**



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# MEN IN THE NEWS

*Eaton Mfg. Co., Heater Div.—Leonard R. Cervenik has been promoted to factory manager.*

*Pioneer Engineering & Mfg. Co.—William P. Panny has been promoted to vice president.*

*Electric Autolite Co. —Dr. Manuel Shaw has been named head of electrochemical research.*

*ACF Industries, Inc., Carter Carburetor Div. —Charles L. Thompson has been named marketing director.*

*Hercules Motors Corp.—Keith D. Evans has been named manager of new Product Reliability Div.*

*Bendix-Westinghouse Automotive Air Brake Co.—Paul E. Friend (far left) has been named production sales manager and Richard W. Adamson has been promoted to Eastern sales manager.*

General Motors Corp., Central Foundry Div.—**Robert A. Titlow** has been promoted to general superintendent, Bedford plant, and **Robert P. Hendrichs** has been named manager, Jones Mills plant.

McCord Corp., Equipment Gasket Div.—**B. Gratz Brown** has been named head of product engineering.

Avco Corp., Lycoming Div.—**Walker G. Dollmeyer** has been named vice president of operations at the Stratford plant.

Ford Motor Co., Aeronutronic Div. —**Donald E. Wright** has been appointed manager of strategic communications for electronic operations.

Parker-Hannifin Corp., Power Cylinder Div.—**James P. Fairbairn** has been named chief engineer, mobile hydraulic cylinders.

B. F. Goodrich Co., Sponge Products Div.—**J. M. Montefalco** has been named general manager.

Allis-Chalmers Mfg. Co. — **J. S. Quinn** has been named manager of Omaha district office.

Ford Motor Co., Ford Div.—**George A. Schumm, Jr.** has been promoted to associated products marketing manager.

Clark Equipment Co., Brown Trailer Div.—**Joseph H. Dolan** has been appointed assistant general sales manager.

Oakite Products Co. — **Paul R. Bower, Jr., Robert D. Casey** and **Michael D. Juliana** have been named technical service representatives.

Willys Motors, Inc.—**Paul B. Hartman** has been named chief military engineer.

Borg-Warner Corp.—**Dr. Donald W. Collier** has been named vice president-research.

Budd Co., Instruments Div.—**Richard E. Love** has been appointed marketing manager.

Studebaker-Packard Corp., Export Div.—**R. D. Thomas** has been named assistant to the vice president.

White Motor Co.—**John H. Mangle** has been named assistant vice president-finance.

Bendix Corp. — **Dr. Gilford G. Quarles** has been named director of long-range military planning and **Charles M. Edwards** has been appointed western corporate representative.

Eaton Mfg. Co., Axle Div.—**Robert P. Clayton** has been promoted to office manager.

Tidewater Oil Co. — **Harrison B. Haney**, vice president of transportation, has retired after 43 years.

Norton Co. — **John J. Amero** has been appointed chief, vitrified bond unit in the research and development department.

General Motors Corp., Cadillac Div. —**Daniel M. Adams** has been promoted to assistant chief engineer for production and **Carl A. Rasmussen** has been named assistant chief engineer for future development.

LeTourneau - Westinghouse Co. — **Lloyd A. Rager** has been named manager of products marketing department.

## Necrology

**Stanley Menton**, 64, retired manager of the manufacturing staff of General Motors Overseas Operations Div., died Nov. 14 in Detroit.

**James E. Savacool**, 75, retired vice president and comptroller of Mack Trucks, Inc., died Nov. 14 in Blairstown, N. J.

**Edward F. Coogan**, 72, president of the former Autocar Co., died Nov. 12 in Philadelphia.

**Joseph Pomerantz**, 55, a superintendent in the Chrysler Corp. Jefferson plant for 32 years, died Nov. 2 in Detroit.

**John A. Hawkins**, 73, retired superintendent of the Ford Motor Co. pressed steel plant, died Oct. 30 in Detroit.

**Paul P. Huffard**, 72, former director and vice president of Union Carbide Corp., died Oct. 30 in New York City.

**Arthur Lehr**, president of Bliss & Laughlin, Inc., died Oct. 29 in Chicago.

# EXTRA WIDE VISION, MORE SAFETY, MORE COMFORT

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Wherever vision and comfort are improved, accidents are less likely to happen. When they do happen, you want maximum protection.

This new B&L goggle helps all 3 ways: improves vision, provides more comfort, gives maximum protection.

Made of molded rubber, with soft-rolled edges, it shuts out chemical vapors while it gives up to 15% wider field of vision. B&L impact-resistant safety lenses, in S-7 shape, measure 66 x 59 mm. Deep lens grooves assure positive lens seating.

Forest green rubber is acid-resistant, easy to clean. The goggle fits over any modern ophthalmic frame. Rubber headband adjusts in a twinkling.

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BAUSCH & LOMB SINCE 1853

**Protection-PLUS Safety Products**

protection + economy + worker acceptance



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## an Editorial

# The Industry Speaks

THERE ARE TIMES WHEN THE ACTIONS of the industry speak louder than any words which could be composed into an editorial by an individual. These days are such times. The actions of the automotive industry tell us many important things which deserve repeating.

THE NATIONAL AUTOMOBILE SHOW SPOKE louder than any editorial in telling the entire country that this industry is outstanding in providing value, service and "user benefits" on a scale seldom equalled in economic history.

THE FORD FOUNDATION SPOKE LOUDER than words by financing advanced technical steps in educational methods which are much more profound, useful and significant than anything that centralized governmental agencies have produced.

CHRYSLER CORPORATION SHOWED INTEGRITY in management by taking its own actions to revise and improve ethical standards of conduct of executives.

WHITE MOTOR COMPANY SHOWED ASTUTE and discerning insight into the dynamics of the future by pioneering new steps in corporate expansion through the acquisition of the Oliver Corporation farm equipment products lines.

WILLYS MOTORS, INC., DEMONSTRATED UNIQUE capacities to meet and deal successfully with world-wide corporate opportunities for international expansion through the development of new plants and manufacturing facilities in many locations.

ALLIS CHALMERS MANUFACTURING COMPANY has proved that original research, engineering and development methods can create exceptional profit and sales opportunities despite any general economic recession trends.

STUDEBAKER-PACKARD CORPORATION HAS effectively resolved such problems of organization and manpower utilization as have seldom been seen within one year of corporate industrial experience.

GENERAL MOTORS CORPORATION BACKED UP its estimate of a 7 million car year in 1961 by announcing that it will spend $1,250,000,000 for new plants, machinery, equipment and tooling next year.

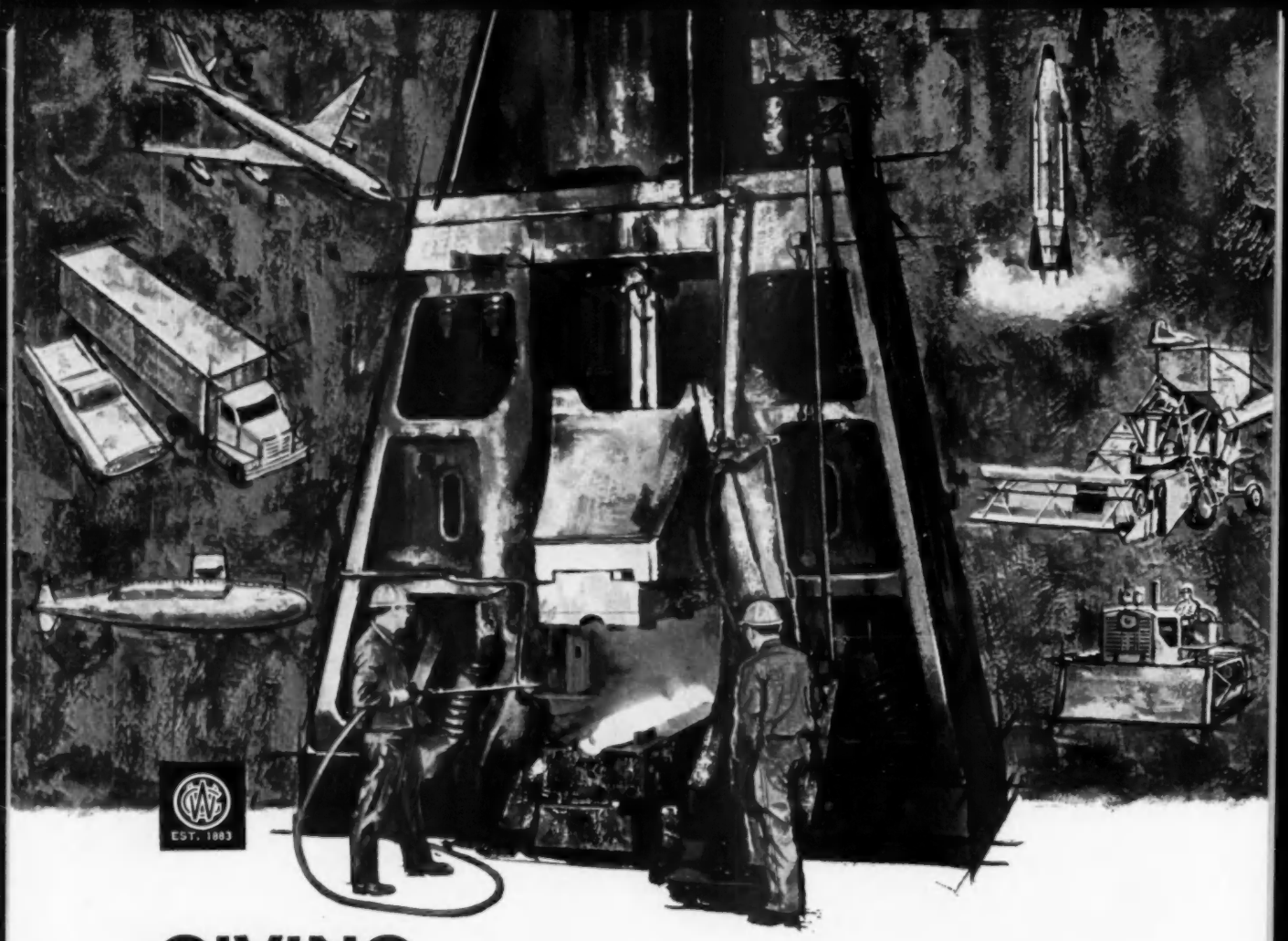
THE ROSTER OF THESE "ACTION EDITORIALS" would not be complete without mentioning in this account the significant steps taken by Caterpillar Tractor Co., Deere & Co., Avco Mfg. Corporation, Mack Trucks, Inc., the Budd Company, International Harvester and scores of others. In recent months each of these firms has pioneered noteworthy developments. Taken together, their activities would comprise a virtual saga of modern economic and engineering advancement.

DURING THE COMING MONTHS THE SPOTLIGHT of public attention will be on activities in Washington, D. C., far from the scenes of these important industrial developments. Analysts who are usually well informed now tell us that the new national programs which can be expected include legislative investigations of "administered prices," efforts to revise the "Taft-Hartley Law" and steps to strengthen the bargaining position of unions. The incoming administration is reported to favor the use of the power of the government to seize plants when they are paralyzed by strikes. But the new policy-makers do not approve of compulsory arbitration, we are told.

WHEN SUCH PROGRAMS MOVE INTO PROMINENCE in the news, we hope that Congress and the American People will not forget that plans to "control the economy" are not a substitute for creative, dynamic and constructive actions in private industry. Regulation is not a synonym for progress. The real road to progress is the expansion and development of industrial production.

Hartley W Barclay

**Editor and Publisher**

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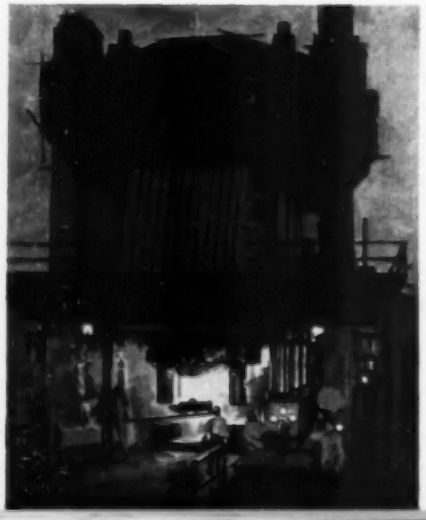
Specify "punishing service" in any environment—land, sea, air or space—and there is no substitute for a forging's endurance. Likewise, specify reliability in your supplier and there is no substitute for experience.

Here Wyman-Gordon has the outstanding record. Our background in hot working all forgeable materials covers more than three-quarters of a century. From it have come most of today's major advances—in forging techniques, metallurgical controls and development of facilities for extending size and complexity of forged parts. This accumulated know-how has done much to make Wyman-Gordon "forging headquarters" for an impressive list of industrial leaders.



Most likely our experience in saving weight, adding strength and reducing machining cost on countless other parts—can do as much for yours. To get expert appraisal, ask to have a forging engineer call while designs are still on the board.

## WYMAN-GORDON

### FORGINGS

*of Aluminum Magnesium Steel Titanium . . . and Beryllium Molybdenum Columbium and other uncommon materials*

HARVEY ILLINOIS — WORCESTER MASSACHUSETTS — DETROIT MICHIGAN

GRAFTON MASSACHUSETTS — LOS ANGELES CALIFORNIA — PALO ALTO CALIFORNIA — FORT WORTH TEXAS

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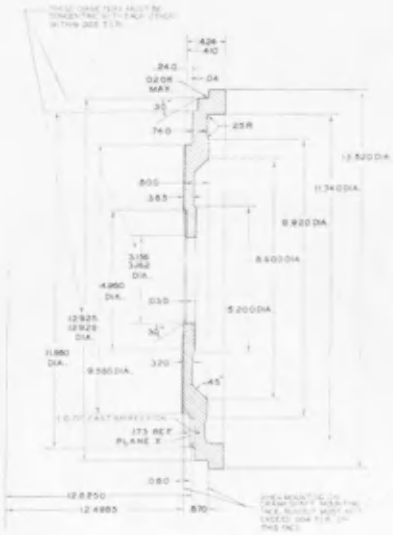
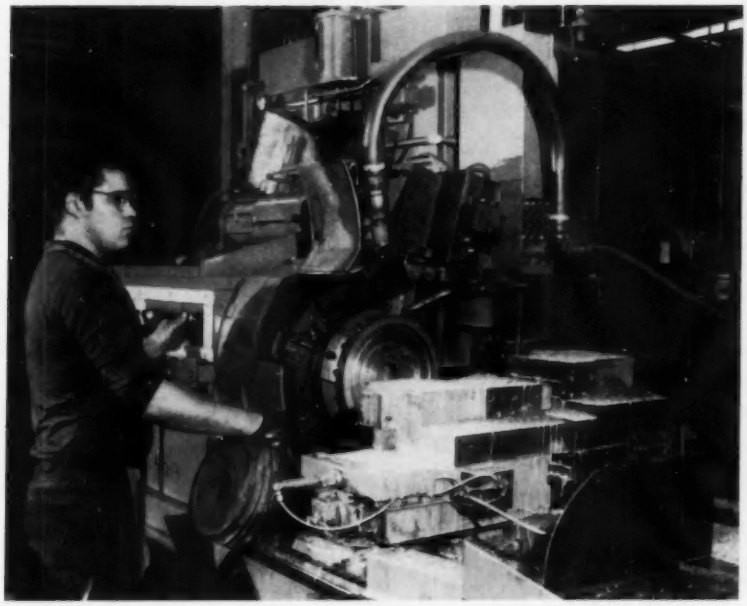
# Machining Operations on 1961 Oldsmobile Components



*One of the flywheels machined in this department.*



***Close-up of work station of one of the Gisholt Simplimatic machines on the flywheel line.***

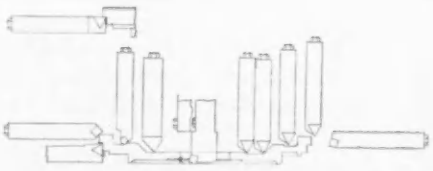
## PART I


## By Joseph Geschelin

DETROIT EDITOR


WITH the introduction of its 1961 models Oldsmobile has unveiled a number of interesting developments in the manufacturing departments. Among the highlights are: a flywheel machining department; a compact transfer machine line for machining steering knuckles for the F-85 car; a noteworthy transfer machine line for machining aluminum cylinder heads for the F-85 aluminum V-8 engine; and an extensive layout of special equipment for producing the fabricated front cross member for the F-85.

In the interest of adequate presentation we have elected to cover the details of flywheel fabrication and steering knuckle machining in this article. The other items will be handled in the next installment on Oldsmobile.

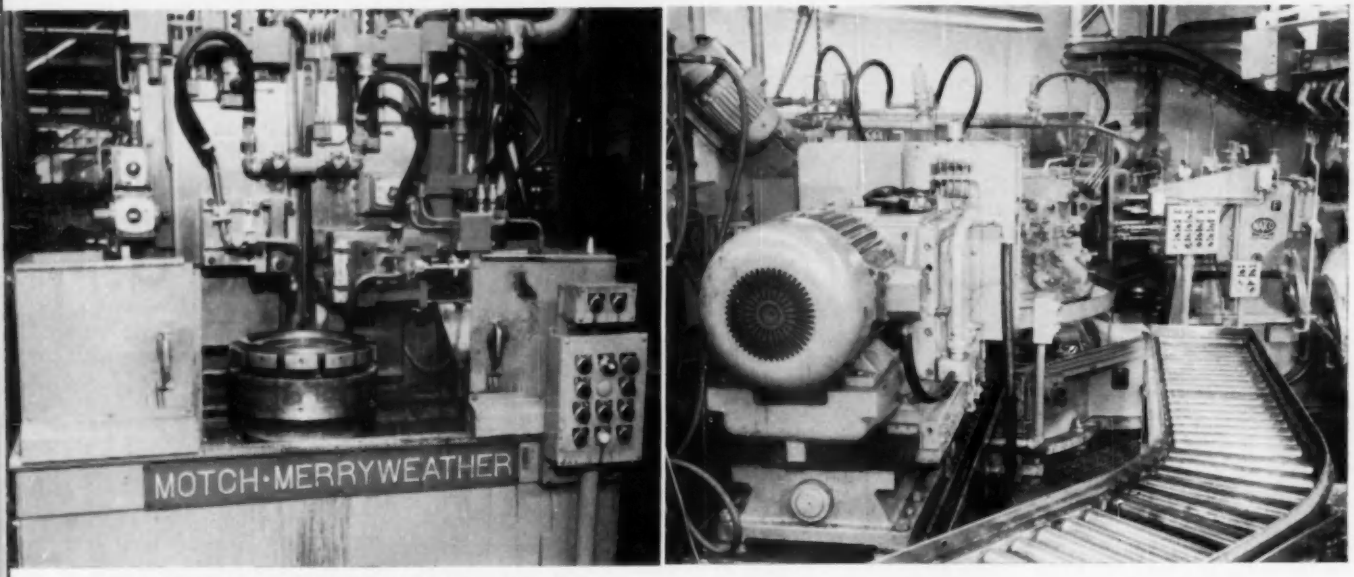


***Tool layout for flywheel machining in the Gisholt Simplimatic.***

### FLYWHEEL MACHINING

Flywheels are being manufactured by Oldsmobile for the first time in its modern operations. Starting with 1961 production the division had the problem of producing five different cast iron flywheels—two for the standard car line; and three of the size required for the F-85 engine.

The initial solution for this problem is found in the establishment of two separate flywheel machining lines, both employing the same makes and types of equipment. Basic chip removal on both lines is handled by an installation of Gisholt Simplimatic automatic chuck-




*M & M special vertical, single-spindle lathe for turning and boring the flywheel.*

ing lathes, latest models of basic equipment that has been employed in the automotive industries for a great many years. Since both lines operate on the same principle, we have elected to describe one line, the one that handles the standard car flywheel in two versions —for synchromesh and for Hydra-Matic transmissions.

On each line it is necessary to run flywheels in batches or lots since each one requires a different tool setup. Tool changes and other modifications that may be necessary are made in a relatively short down time. As a matter of fact, the prime reason for selecting Simplimatics, apart from the numbers involved, is that this equipment lends itself so readily to such quick changes in tooling on the standard tool slides.

Let us consider now the setup for machining the standard car flywheel for HydraMatic drive. First of all the machining dimensions can be visualized from Fig. 1. Flywheels are of cast iron, normalized for best machinability. By the time this article is in print the major foundry problems will be out of the way and castings will come in requiring the very minimum of stock removal.

First operation is on a Simplimatic with the rough casting held in a 21-in. three-jaw air chuck. It handles the following group of operations: rough-turn rear side complete; rough- and finish-turn the ring gear seat; and rough-bore the center hole. This requires a group of three solid carbide-tipped tools and eight throw away inserts as shown in the tool layout, Fig. 2.

*Above — right — Natco 7-station way-type drilling machine for producing the variety of bolt circle drilling operations on flywheels.*

*At right — Flywheels are balanced in this Micro-Poise static balancing machine to a tolerance of ¼-oz. in., using small aluminum pins for balance weights.*

The next step is the shrink-fitting of the steel ring gear. This is done in a special machine developed at Oldsmobile. Essentially, it is a fully automatic, two-station unit with flywheel ring gears loaded on a vertical fixture. While in this position the parts are heated by an infra-red unit to a uniform temperature of 450 F.

As a part of the reliability program a sample assembly is then selected by the inspector and is subjected to a severe torque test to make sure the gear is permanently locked in place with no risk of loosening in service. This test applies a torque of 35,000 lb in.

Flywheels now return to the machining line and are clamped in the second-operation Simplimatic. Here again is a group of 10 tools arranged for the following operations: rough-turn the front side; finish-turn the crank mounting face. For this stage the part is clamped directly over the ring gear.

For the next operation the work goes to a Motch & Merryweather, vertical type, single-spindle lathe

for finish-turning the rear face, and finish-boring the center hole.

The last major operation is the drilling of a number of bolt circles. Since the number of holes as well as hole spacing varies with the part number, it was necessary to devise some flexible method that could be readily adapted to lot production. The solution is found in the seven-station Natco way-type drilling machine, fitted with a seven-station fixture in the center. Each of the drill heads contains a sufficient number of spindles, with proper spacing, to handle the required number of flywheel options. The only change necessary for a given flywheel is to insert the tools in the required spindles. Even this job has been simplified by identifying the group of spindles for a given part number by a color code so they may be readily selected from the tool board.

On the part described here, the first drilling station—station 2—drills a group of 27 holes in two bolt circles. Station 3 is idle for this part. Station 4 drills 11 holes. Station 5 is idle. Station 6 reams eight holes. Station 7 taps six holes. The part then enters a washer and continuing on the conveyor moves to the balancing station.

The flywheels are removed from the conveyor and placed on the table of a Micro-Poise static balancing machine. Here the part is balanced to a tolerance of ¼-oz in. by means of small aluminum pins inserted in specially designated hole locations.

Chip removal on the Simplimatic lathes is of the order of 300 sfpm with +200-in. per minute feed rate.

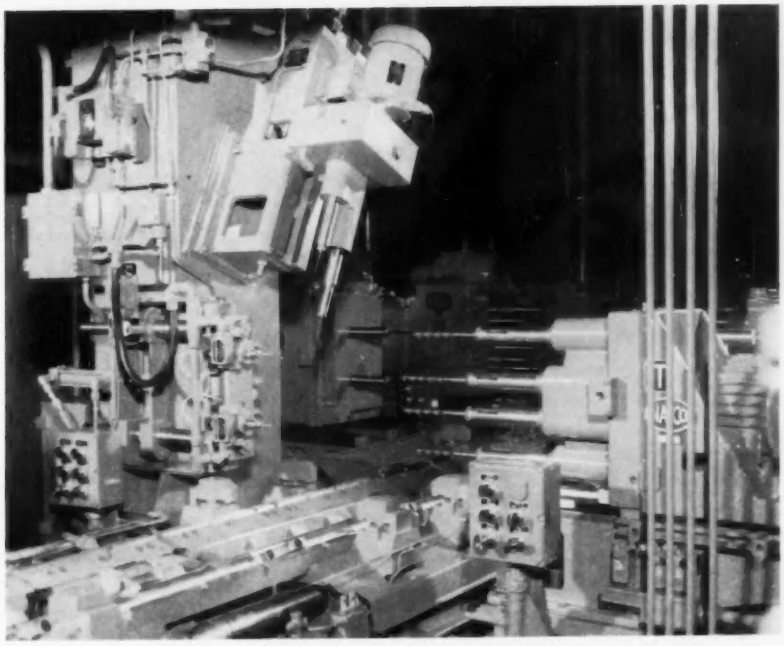
To us the significant feature of this advanced flywheel machining arrangement is the flexibility of equipment and tooling in the interest of expediting batch type manufacturing.

## STEERING WHEEL KNUCKLE MACHINING

Oldsmobile also has developed an advanced procedure for machining steering knuckles for the F-85 car. Most of the operations on this part are handled in a fully automatic cycle in a 20-station, straight line Natco transfer machine of pallet type. The pallet type machine was selected specifically to assure complete control of machined surfaces in their proper relation to one another.

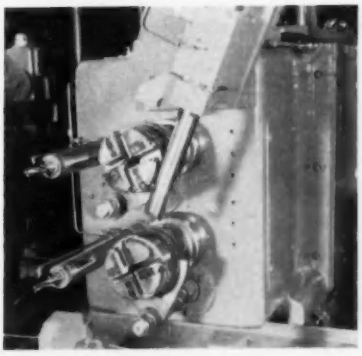
(*Turn to page 72, please*)

***Perspective of the 20-station pallet-type Natco transfer machine for machining F-85 steering knuckles. Each of the pallets holds a RH and a LH part.***



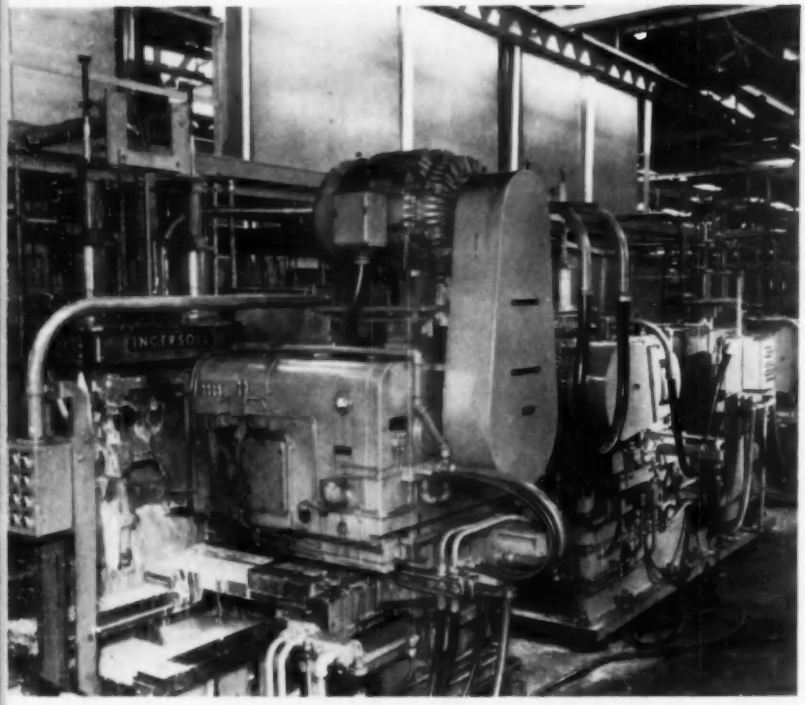
***Close-up of Station 13 of the Natco machine. It drills two cotter pin holes; chamfers four holes; probes and flushes two holes.***

***Close-up of Station 15 of the Natco machine.***



# Automated Equipment for Machining Aluminum Cylinder Blocks

By
Joseph Geschelin
DETROIT EDITOR

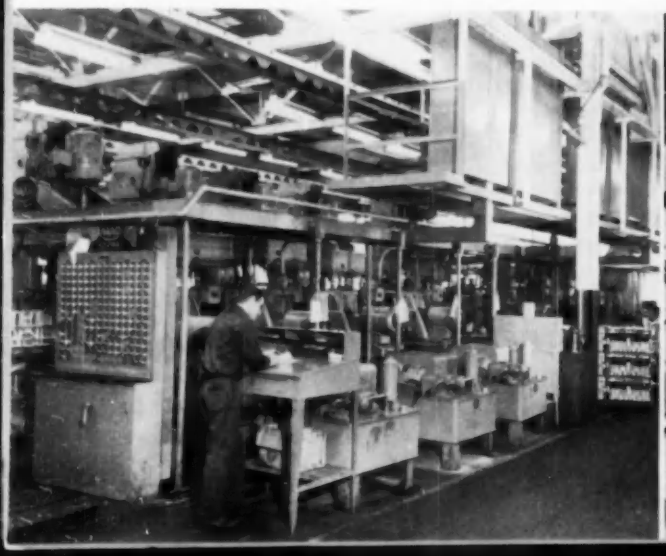


*One section of an Ingersoll transfer machine on the aluminum cylinder line in Kenosha. The initial stages of the machine line have an 8-station Ingersoll transfer machine, followed by an 11-station Ingersoll.*

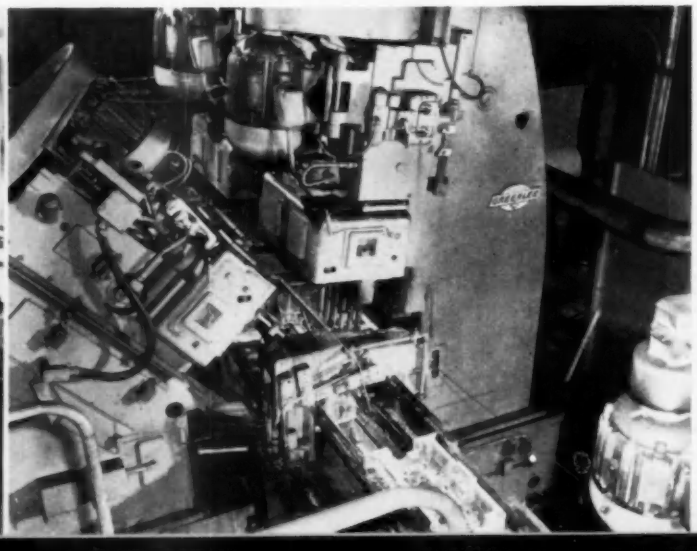
**The die-cast aluminum cylinder block for American Motors' OHV Six is machined on an impressive line of transfer machines installed for this purpose. Some of the background for the development of this engine as well as details of the die-casting procedures at Doehler-Jarvis appeared in AUTOMOTIVE INDUSTRIES November 1, 1960. The present article is concerned with the machining of the block.**

**Apart from the sequence of operations on the transfer line, it is noteworthy that milling and drilling operations have been stepped up in speeds and feeds to figures in keeping with the machinability of aluminum. For example, on the initial Ingersoll milling operations, cutting is done at a speed of 1271-sfpm, with a feed rate of 100-in. per minute. This important increase in speeds and feeds, as contrasted with conventional cast iron machining, accounts for increased hourly block output from this line.**

*Loading end, with console in view, of the 25-station Natco drilling and tapping transfer machine.*



*Close-up of one section of the 25-station Greenlee transfer machine for drilling, boring and tapping, also including gun-boring of tappet bores.*



THE cylinder block line to be described here consists of a number of different makes of machines, tied together by automation and transfer bars. The first section is composed of Ingersoll milling machines. This is followed by Natco drilling and tapping units; a Greenlee transfer machine including heads for gun-boring the valve tappet bores; a Lamb transfer machine; and other equipment. Details of the arrangement will follow. Due to space limitations the line is installed in parallel sections with Centri-Spray automation connecting the open ends of the line at each terminal point. In addition, there are two of the large Centri-Spray washing machines installed in the line.

One of the noteworthy features of the equipment is the installation of two Micromatic horizontal honing machines for honing the crank bearing line. While the basic machine is quite well known, the unique feature here is the fact that the honing abrasive sticks are required to finish a composite bore consisting of aluminum in the case and cast iron in the bearing cap. To do this job effectively required some modifications in boring bar design as well as in the selection of a suitable abrasive.

Let us now look at the sequence of operations. The first unit of the transfer line is an 8-station Ingersoll milling machine. The operations are as follows:

| Station | Operation |
|---|---|
| 2 | Mill locating and transfer spots (for locating succeeding steps). |
| 3 | Rough-bore half-round crank bearings. |
| 4 | 90-deg turnover. |
| 5 | Rough-mill bearing cap seats, mill front of rear bearing. |
| 6 | Rough-mill panrail. |
| 7 | Finish-mill panrail and bearing cap seats. |
| 8 | Drill and bore dowel holes. |

This is followed by an 11-station Ingersoll machine with the sequence of operations as follows:

| Station | Operation |
|---|---|
| 2 | Rough-mill head surface, oil gallery cover, and distributor boss. |
| 3 | Mill crank bearings to width. |
| 4 | Mill bearings lock notches, mill oil pump and fuel pump pads. |
| 5 | 90-deg turnover to panrail down. |
| 6 | Rough-bore #1, 3, and 5 cylinder bores. |
| 7 | Rough-bore #2, 4, and 6 cylinder bores. |
| 8 | 90-deg turn around. |
| 9 | Rough-mill ends. |
| 10 | Finish-mill ends. |
| 11 | Unload. |

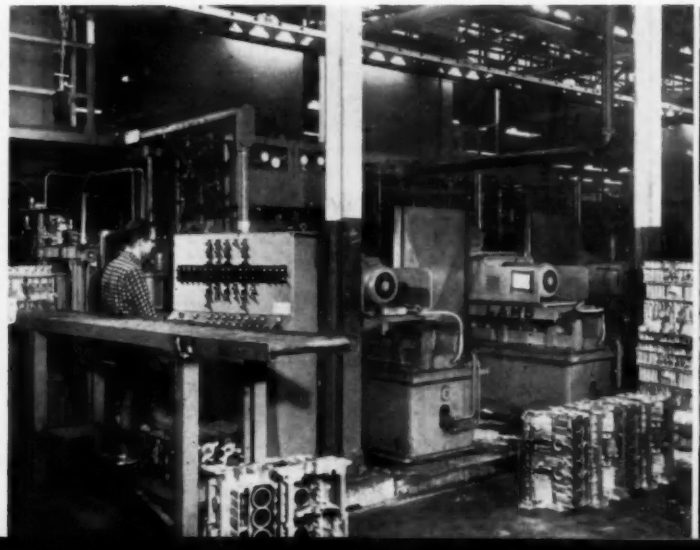
The ends of these two machines are connected by means of a Centri-Spray automation conveyor link with an indexing fixture at the corner.

Next in line is a special 25-station Natco drilling and tapping transfer machine with the following sequence of operations:

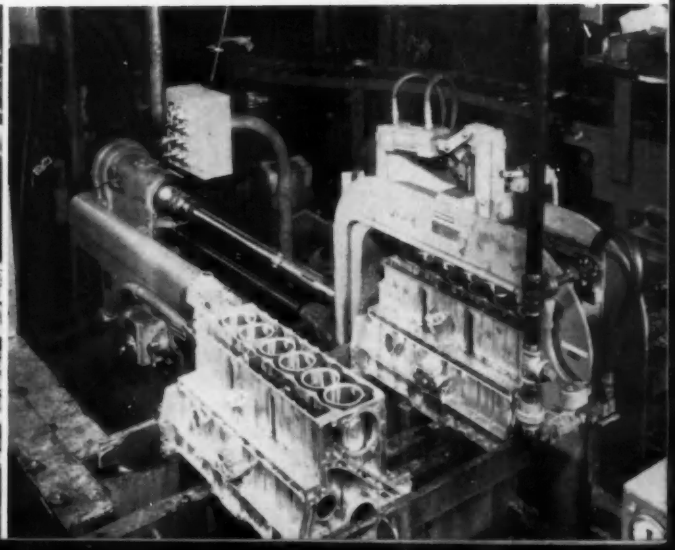
| Station | | Operation |
|---|---|---|
| 2 | Vert. Head | Drill 20 holes. |
| | Horiz. Head | Drill two holes, drill and chamfer three holes. |
| 3 | | Idle. |
| 4 | Vert. Head | Chamfer 17 holes, redrill one hole part way. |
| | Horiz. Head | Drill one hole half-way, drill six holes. |
| 5 | | Idle. |
| 6 | Horiz. Head | Chamfer eight holes, redrill one to full depth. |
| 7 | | Idle. |
| 8 | Vert. Head | Ream two dowel holes. |
| | Horiz. Head | Drill six holes, semi-finish-bore oil pump hole. |
| 9 | | Idle. |
| 10 | Vert. Head | Probe 32 holes for depth. |
| | Horiz. Head | Probe 28 holes for depth. |
| 11 | | Idle. |

(*Continued on next page*)

***A portion of the 11-station Lamb transfer machine for drilling, boring and tapping operations.***



***A special application of the Micromatic horizontal honing machine. At Kenosha two of these machines are used for honing the main bearing line. What makes the operation noteworthy is that half of the bore is aluminum, the other half cast iron.***



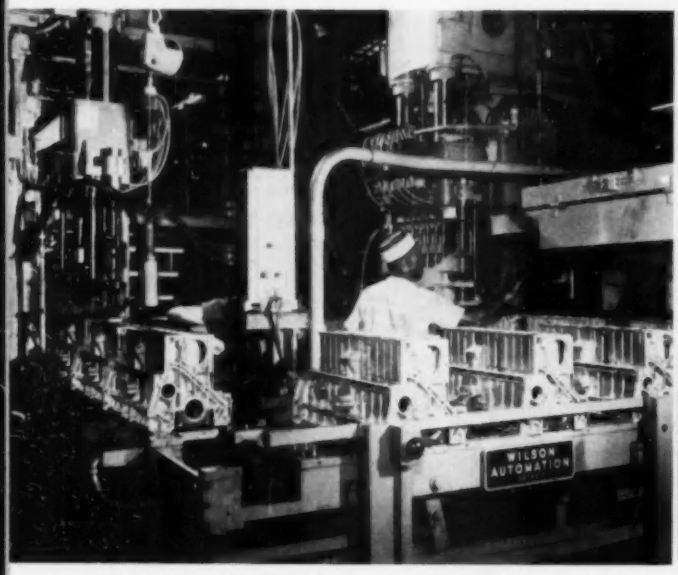


*Illustration above—Cylinder bore honing is done in these Barnesdrill multiple-spindle vertical honing machines. Illustration at right shows an example of Centri-Spray automation at Kenosha. Blocks are lifted from floor level on the elevator in the foreground, then transported over the wide aisle on overhead conveyor to another machine line section.*

| | | |
|---|---|---|
| 12 | Vert. Head<br>Horiz. Head | Tap 17 holes.<br>Tap 15 holes. |
| 13 | | Idle. |
| 14 | Horiz. Head<br>Ang. Head | Comb. rough-bore & chamfer two welch plug holes, drill seven holes.<br>Drill and chamfer one hole. |
| 15 | | Idle. |
| 16 | Ang. Head<br>Horiz. Head | Drill distributor hole.<br>Finish-bore two welch plug holes, finish-bore one hole, chamfer six holes. |
| 17 | | Idle. |
| 18 | Horiz. Head<br>Ang. Head | Drill one hole, spotface four bosses.<br>Drill distributor hole through. |
| 19 | | Idle. |
| 20 | Horiz. Head<br>Ang. Head | Probe 8 holes for depth.<br>Probe two holes for depth. |
| 21 | | Idle. |
| 22 | Ang. Head | Form undercut in distributor bore. |
| 23 | | Idle. |
| 24 | Ang. Head | Tap one hole. |
| 25 | | Turnover and unload. |

Distinctive feature of this Natco transfer machine is that drilling operations are subjected to two special controls. One of these is the use of individual probing stations, as noted above; the other is an air-controlled drill detector on all spindles having long drills. This checks automatically to make sure that a drill has not broken off in the casting.

A 25-station Greenlee drilling, boring, and tapping machine is next in line with the sequence as follows:

| Station | | Operation |
|---|---|---|
| 2 | Ang. Head<br>Ang. Head | Drill four oil lead holes ½-way.<br>Drill six valve tappet holes. |
| 3 | Ang. Head<br>Ang. Head | Drill four oil lead holes ⅔-way.<br>Drill six valve tappet holes. |
| 4 | | Idle. |
| 5 | Vert. Head | Drill 24 holes. |
| 6 | Vert. Head | Drill three holes. |
| 7 | | Idle. |
| 8 | Vert. Head<br>Horiz. Head | Chamfer 21 holes, drill & chamfer two holes.<br>Drill two holes. |
| 9 | Vert. Head | Drill one oil hole. |
| 10 | | Idle. |
| 11 | Ang. Head | Redrill 6 holes and cut clearance. |
| 12 | | Probe and blow-out four oil leads. |
| | Ang. Head | Redrill 6 holes and cut clearance. |
| 13 | | Idle. |
| 14 | Vert. Head | Probe and blow-out 27 holes. |
| 15 | Vert. Head | Tap 24 holes. |
| 16 | | Tap two holes. |
| 17 | | Idle. |
| 18 | | 360-deg turnover to dump chips and coolant. |
| 19 | | Idle. |
| 20 | Ang. Head | Gun bore four tappet holes. |
| 21 | Ang. Head | Gun bore four tappet holes. |
| 22 | Ang. Head | Gun bore four tappet holes. |
| 23 | | Idle. |
| 24 | | 180-deg turnover. |
| 25 | | Manual unload. |

Retracing our steps a bit, it is of interest that the Natco transfer machine, mentioned earlier, marks the end of one stretch of the line, the Greenlee machine, noted above, starting another parallel section of the line. The connection between the Natco

(*Turn to page 82, please*)

# New Lightweight Engine Has Stainless Steel Cylinder Block

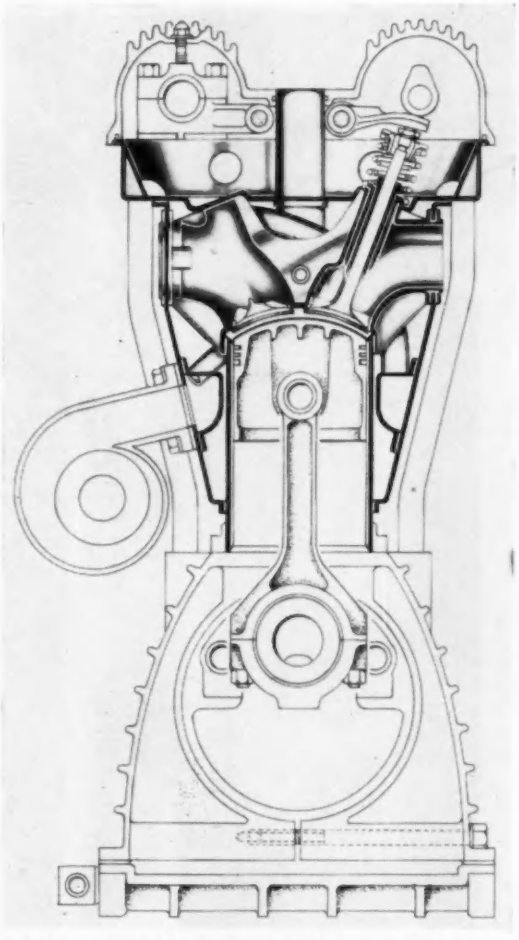
A HIGH performance custom engine with the cylinder block made of thin sections of Type 302 stainless steel fabricated by hydrogen brazing was shown at the ASBE meeting in Detroit by its producer—Tyce Engineering Corp. of Chula Vista, Calif. It is a four-cylinder engine with dual camshafts and hemispherical combustion chambers. The two-piece crankcase and the valve covers are lightweight aluminum castings.

Cylinders employ pressed-in steel sleeves for exceptional durability. The engine has a standard bore —3.50 in.—and is available in four displacements—91-cu in., 105-cu in., 120-cu in., and 135-cu in.—by using crankshafts of different stroke. Incidentally, the crankshaft is cast of ductile iron, and is cored from one end to the other. By this means the crankshaft serves the function of the main oil gallery.

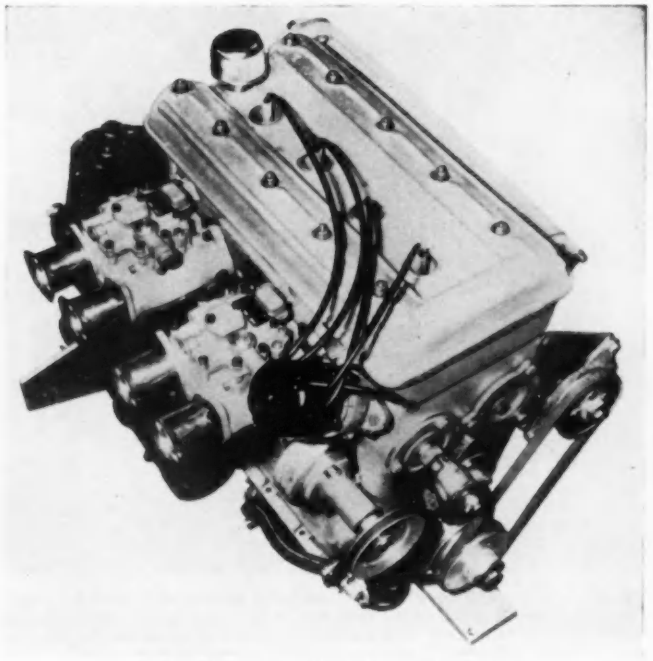
This is a high-priced, custom type of engine intended primarily for marine use, for sports cars, and for racing cars. Compression ratio can be varied from 11 to 1 to as high as 14 to 1. All versions develop maximum output at 6500 rpm.

Several standard parts for Detroit cars were adopted for the Tyce/Taylor engine—Thunderbird intake and Pontiac exhaust valves, and Ford Six connecting rods. It is said that several transmissions, including the Corvette 4-speed and the Falcon 3-speed units, can be used with the new engine. Special adaptor units permit "swapping" the lightweight, high performance engine into such sports cars as the MG, Triumph, and Austin-Healey.

Weight of the four different displacements is about the same—175 lb without starter or generator. The 105-cu in. size will be employed exclusively for midget racing; the 91-cu in. size provides increased performance possibilities for inboard racing boats. ■



*Part-cutaway transverse sectional view of the new engine.*



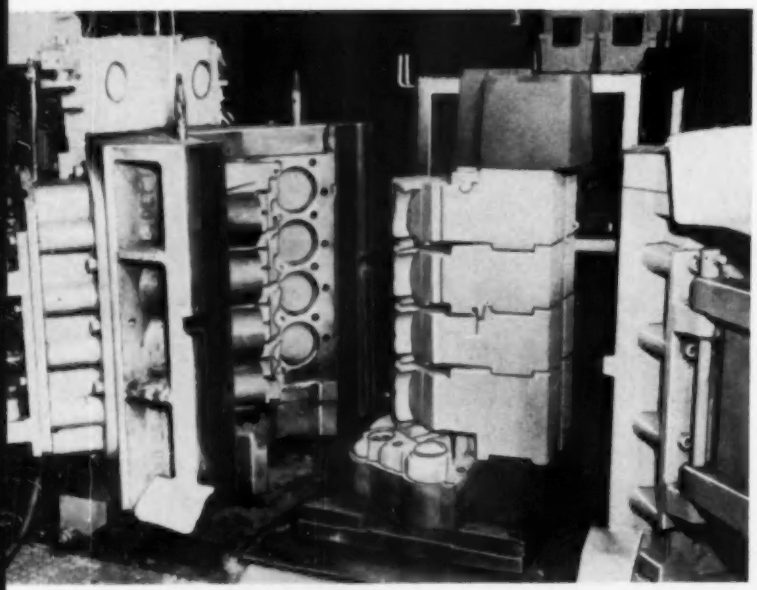
*The Tyce Taylor engine weighs only 175 lb.*

# Casting Aluminum Cylinder Blocks in Semi-Permanent Mold Machines

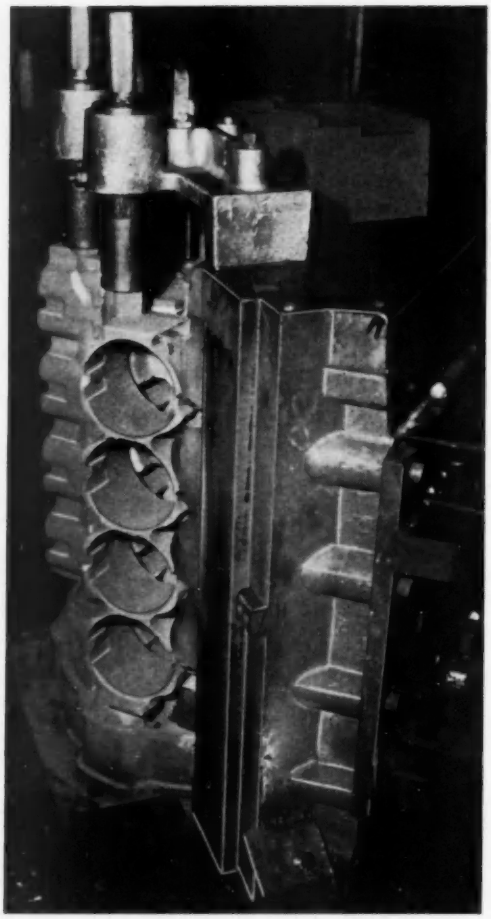
CENTRAL Foundry Division of General Motors is casting aluminum cylinder blocks and heads in its Defiance, Ohio, plant for the new Buick Special V-8 engine, the Oldsmobile F-85 Rocket V-8, and the lightweight V-8 engine which is optional in the Pontiac Tempest. This is said to be the first time than an American foundry has successfully mass- produced aluminum V-8 cylinder blocks and heads.

Cylinder blocks are produced in semi - permanent mold machines that are hydraulically operated, and use both water-cooled metal dies and disposable sand cores. The

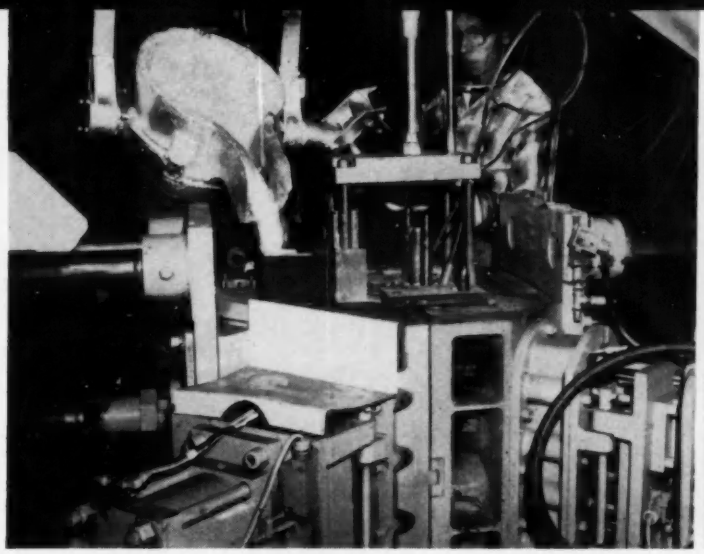
*Two permanent mold sections can be seen. The section on the right forms the outside of the block casting; the section in the center is the lower mold and partially forms the bell housing part of the casting.*



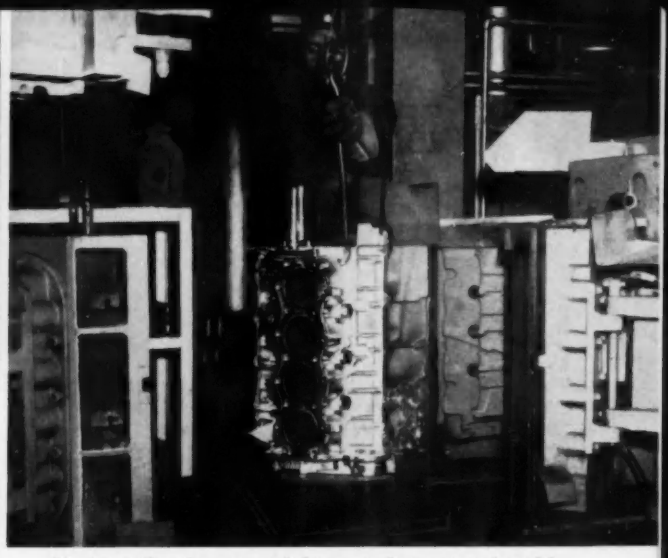
*(Center) Dry sand core which forms the pouring box sets on top of four sand crank case cores and the lower section of the permanent mold. (Left) Four grey iron cylinder liners are mounted on mandrels in extended position. Liners can be seen on the opposite side in retracted position.*



*Sand cores which form the water jackets are in position, held at the top by a setting fixture.*



*Dies have been hydraulically closed, and aluminum is being poured into the mold.*



*Block casting is removed from semi-permanent mold.*

cores are positioned in the mold cavity to form the water jackets and crankcase. Pre-cast grey iron cylinder liners or sleeves are heated, placed in the mold, and cast integrally within the block. The block-making process is unique in that the castings are poured in a vertical position rather than the horizontal position used in casting grey iron blocks.

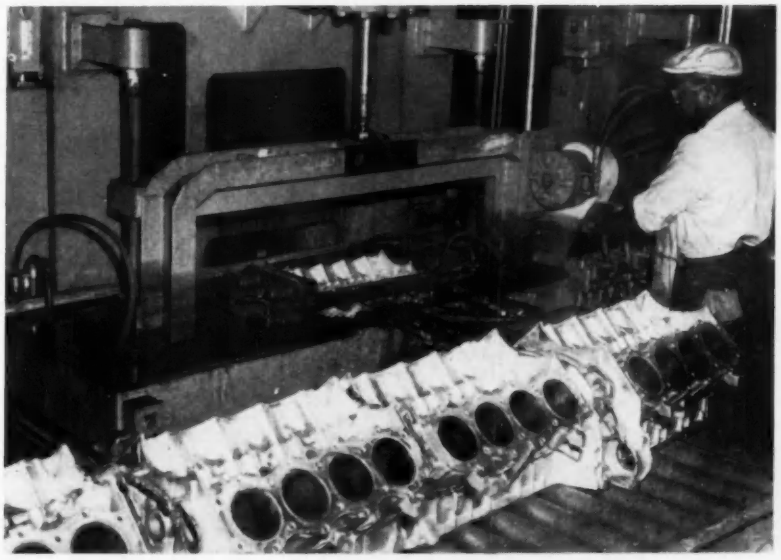
Cylinder heads for the valve-in-head engines are cast in a horizontal position in smaller semi-permanent molding machines. Sand cores are placed in the mold to form the water jacket and ports.

Aluminum is prepared in four gas-fired 40,000-lb reverbatory furnaces. The molten metal is transferred to 1700-lb, gas-fired holding crucibles at the molding platforms and tapped into 100-lb pouring ladles as needed.

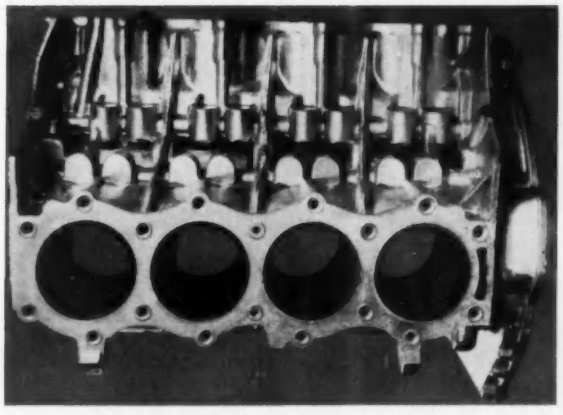
After the castings have cooled, the gates, risers and sprue are removed in automatic transfer machines.

Following machining, the castings are heat-treated to relieve stresses and provide dimensional stability.

Castings undergo a series of quality checks. Metallurgical control is maintained by frequent physical-property tests and quantometer analysis. The castings are submerged in water, pressure-tested with compressed air, and gaged for dimensional accuracy.



*Block castings are submerged in water and pressure tested with compressed air.*



*Completed V-8 aluminum block casting as it appears before machining by the customer.*

Block castings are processed through an automatic qualifying machine which establishes the starting points for machining, and given a final quality check on a specially designed gaging machine which checks 22 separate points on each casting. ■

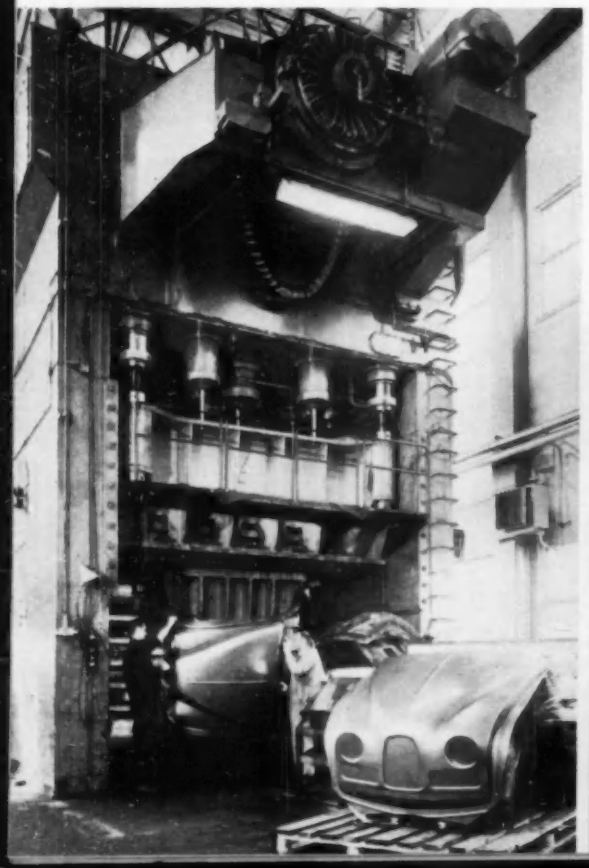
*View of the new 120 by 120 m (approx. 400 by 400 ft) addition to Saab's automobile factory at Trollhättan, Sweden, which was completed November, 1959. With activation of this addition, capacity was increased to 30,000 or more cars annually. The adjacent multi-story building (right) is used for light manufacturing, offices, and service facilities.*

# Automobile Production at Saab

## A Progress Report on this Swedish Builder Reveals Striking Advances Since 1950, New Car Models, and Plans for Further Expansion of Facilities

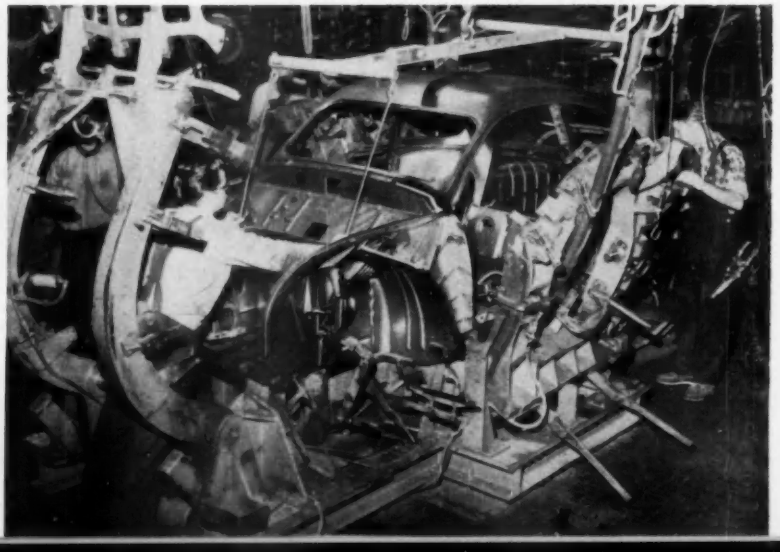

**By Charles A. Weinert**

EASTERN EDITOR

◀ *Saab has seven large presses, all of American make, for producing automobile body stampings. This Clearing press makes the one-piece hood and front assemblies pictured. Thickness of sheet steel used in Saab bodies ranges from 0.9 to 2.0 mm (0.035 to 0.079 in.).*

*From the press shop, the various body sections are transported to the body assembly line, where they are placed in a body jig and welded together to form an integrated structure. Spot welding is mostly employed.*



*Engines and gearboxes for Saab automobiles are produced at the company's Gothenburg plant, which has an annual capacity of 90,000 to 100,000 units.*

JUST about a year ago, the Svenska Aeroplan Aktiebolaget (Saab Aircraft Co.) of Sweden opened a new factory addition at Trollhättan, increasing its facilities for production of Saab automobiles to more than 30,000 annually. This addition, together with enlargement of engine and gearbox facilities at the company's Gothenburg plant, cost about 50 million Sw. Crowns.

Plans are now under way to invest another 50 million Sw. Crowns for further plant expansion at Trollhättan — with the objective that by 1963 the production capability of Saab will be around 60,000 automobiles annually.

The progress of this builder is striking when it is considered that Saab did not begin full-scale automobile production until late in 1949. In the 1949-50 period, production rate was four cars per day; and during the first year, 1200 cars were delivered.

Saab gradually stepped up automobile production year by year, so that by the middle of 1957, a rate of 12,000 cars per year was attained. At that time, the company's board of directors decided to embark on a major expansion program. One of the planned moves was to transfer aircraft production in the Trollhättan plant to the company's Linköping plant, leaving Trollhättan free to concentrate on automobile production. (This transfer was finalized in 1959.) The second principal step was construction of the new factory addition at Trollhättan—completed last year.

By late 1959, a rate of 80 cars per day (or one car every 6.44 minutes), corresponding to an annual rate of 20,000 units, was reached. For the year 1959—the company's 10th in automobile manufacture—output actually totaled close to 18,000 cars.

With the new addition opened last November, facilities now exist

*Typical view of the new final assembly line at Saab, Trollhättan.*

*The new paint shop at Saab, Trollhättan. Pictured are bodies after painting and oven-drying. In the upper background, bodies are being carried by means of overhead conveyor to the final assembly line.*

*The new Saab-95 station wagon pictured with another Saab product, the double-delta-winged supersonic jet fighter "Draken" (Dragon).*

*The 1961 Saab-95 station wagon is designed to seat seven, sleep two, or carry a cargo load of 950 lb. It has a wheelbase of 98 in., an overall length of 162 in., and a curb weight of 1985 lb. Three-speed transmission is standard, with four-speed optional.*

*This five-passenger sports sedan, the 1961 Saab Model 96, is the successor to the Model 93F. Features include new instrument panel, wider rear seat for accommodating three adults, locking device on back of front seat, and wrap-around rear window. It also has a new heating and ventilating system, and roomier (13 cu ft) trunk. Wheelbase is 98 in., overall length 158 in., and curb weight about 1820 lb.*

to produce one car every four minutes, equivalent to a yearly output in excess of 30,000 cars. Actual 1960 production of automobiles, including station wagons, is estimated by a company spokesman at around 25,000 cars.

Along with the expansion of production facilities, Saab has brought out several new models. One is a seven-passenger station wagon, the Model 95—marking Saab's entry into the station wagon field. The second new basic model is a five-passenger sports sedan, the Model 96. Both were introduced to the American market as of October 1; and are equipped with a larger 841 cc (51.3 cu in.) engine.

In addition, the Saab-96 is being offered in the 96GT "Granturismo" model, a deluxe version available with a "souped-up" 748 cc (46 cu in.) engine having a max rating of 57 hp at 5000 rpm, and with a four-speed transmission.

About the company in general: Saab is a major producer of aircraft, as well as of automobiles, and over a period of some 20-odd years has become one of Western Europe's largest makers of aircraft. Since WW II, it has developed and produced in quantities several types of military jet aircraft.

In 1951, the Swedish Air Force

was equipped with the Saab-29 "Flying Barrel," reputed to be the first swept-wing jet fighter to go into service in Western Europe.

Late in 1955, the company delivered the first production transonic Saab-32 Lansen, which has been built in several versions as fighting, attack, and reconnaissance planes. During the same year, the company displayed the prototype of the now-famous Saab-35 Draken (Dragon), a single-seat jet fighter of double delta wing configuration, capable of supersonic speeds.

Saab has four principal plants—at Linköping, Trollhättan, Gothenburg, and Jönköping, Sweden. At Linköping is the company's main office and center of operations. The plant at Trollhättan handles automobile body and assembly operations. Engines and gearboxes are made at the Gothenburg plant (which was acquired in 1953 and subsequently expanded). The Jönköping and Linköping plants are primarily concerned with aircraft production. However, manufacture of the Saab-95 station wagon bodies is being done at Linköping —with final finish and car assembly handled at Trollhättan.

Saab also has a helicopter division at Norrköping which builds the French turbine-driven helicopter "Alouette II," under license.

Saab exports automobiles to various parts of the world, and exports account for almost half of total output. Sales began in the U. S. late in 1956, and the U. S. is its largest export market. Saab is reported to have sold 5200 automobiles in this country during 1959. For 1960, U. S. sales are estimated by a company spokesman at 6000 automobiles. This spokesman also predicted that U. S. sales of Saab vehicles in 1961 will increase still further—probably to around 7500. Distribution in the U. S. is handled through Saab Motors, Inc., New York, a subsidiary of the parent company.

The accompanying picture display shows views of Saab's automobile plant facilities, as well as of the company's latest models. ■

***Engine horsepower has been boosted from 38 to 42 at 5000 rpm for the new Saab models, both station wagon and sports sedan. Bore of the three-cylinder two-stroke watercooled engine was enlarged from 66 to 70 mm, increasing total piston displacement from 748 cc (46 cu in.) to 841 cc (51.3 cu in.). The engine, transmission and differential are interconnected at front end, providing front wheel drive. As will be noted, fan and radiator are located between engine and firewall.***

## Republic Aviation Plans Wind Tunnel

Re-entry problems of vehicles traveling at speeds up to Mach 14 (9240 miles an hour) will be studied in a $750,000 hypersonic wind tunnel to be built by Republic Aviation Corp. at Farmingdale, L. I.

It is known as a pebble-bed hypersonic tunnel, the name being derived from the fact that nearly a million ceramic pebbles a half-inch in diameter are heated to 3000 degrees to pre-heat the air before it is forced through the various tunnel nozzles. The tunnel was designed in cooperation with Dr. Antonio Ferri, of the General Applied Sciences Laboratory, consulting scientist to Republic.

The test section of the wind tunnel will be able to handle models up to a foot in diameter, a size considered large for a facility of this type.

Re-entry and flight trajectory phenomena of glide and lunar return vehicles will be studied under actual flight conditions from altitudes of 80,000 ft and speeds of 2000 mph to 150,000-ft heights and velocities of up to 4500 mph. According to Republic scientists, this includes hypersonic aircraft, such space vehicles as Dyna-Soar and the Mercury capsule as well as air launched ballistic missiles and intermediate-range ballistic missiles.

## Mobil Mileage Rally

A Morris Minor topped all economy sedans with 55.44 mpg and an NSU Prinz was the best sports model with 62.29 mpg as 34 European cars competed in the third annual Mobil Mileage Rally.

Starting in midtown Manhattan at dawn and looping through three states and 46 towns and cities, the foreign-built cars crossed the finish line in New Rochelle, N. Y., after traveling 200 mi in 6½ hours.

Sports cars topped family sedans by an average of one mpg. The 12 two-seater sports cars averaged 40.95 mpg, while the four-passenger sedans had a combined average of 39.85 mpg.

Governed and sanctioned by the United States Auto Club the Mobil rally field was broken into four classes for passenger cars and two classes for sports cars according to engine size.

# Quality Evaluation Procedures Employed in Lincoln-Continental Assembly

By Joseph Geschelin
DETROIT EDITOR

"24-24" is the new warranty on 1961 Lincoln-Continental cars. A bold step on the part of the Lincoln-Mercury Division, it connotes full reliance upon the effectiveness of the current drive for improved quality and durability.

At Wixom (Mich.) where Lincoln-Continental cars and Thunderbirds are built there is a concerted drive to produce cars that can be delivered to the customer ready to run without further attention. Every step in the process from the receipt of parts and sheet metal to the acceptance of cars at the door is subjected to scrutiny and inspection and testing stemming from the current Quality Evaluation program.

In the first place, quality control must begin with the acceptance of parts and accessories, major components and sheet metal. Unless every detail conforms to the standards established by engineering, the finished product either will not function properly or it will lack the requisite durability. To this end, all outside suppliers are policed by the Ford Division surveillance program in addition to the receiving inspection at Wixom.

Sheet metal parts that go into the body assembly are subjected to additional scrutiny by inspection in master gages on a statistical basis where there is no evidence of lack of control. If any lack of control is found, it is common to withhold an entire lot and subject it to 100 per cent inspection, possibly to rejection.

Major components such as the engine assembly, automatic transmission, and rear axle are subject to rigid inspection and testing at the supplying plant. For example the engine assembly is given a three-hour "hot" test before acceptance. The carburetor is sealed to eliminate tampering with calibration.

A great deal of attention is given to body fabrication for assurance that the specified operations have been performed and that the welds are sound. This is done by roving inspectors on the welding lines. Each welding station is checked twice during a shift and, in the process, a chisel-test inspection is made of selected spot welds on the body to assure sound welds. This is a destructive test which requires repair. This procedure also verifies the condition of welding electrodes on each gun to make sure they are all properly dressed.

Body fabrication is handled the same as before, employing fixed welding bucks. Some of these are tooled exclusively for T-Bird, several are arranged to handle either Lincoln-Continental or T-bird. In fact, the only noticeable change is that with the increase in volume the welding bucks no longer weld the roof panel. This operation is performed on the final section of the body assembly conveyor along with other welding operations. This conveyor feeds directly to the body-in-white booth.

Once car assembly is under way each step in the process is carefully watched to assure proper quality. Each car is subjected to a rigid water test and thoroughly inspected all over, including the trunk area, for evidence of leaks.

Perhaps the most searching formal test on Lincoln-Continental cars, as they come off the line, is the EAGER test on each vehicle. This test procedure for checking out the entire electrical system—components as well as wiring harness—was developed by Ford Division Manufacturing Operations group and has been translated into an electronic equipment test illustrated here.

Five simple connections attach EAGER to a vehicle, with connections and attaching cable supported by a folding boom for each access and hook-up.

EAGER's complex integration of electrical test equipment is programmed by using a 35 mm film and a bank of photocells. A word description of the test to be performed is projected on a glass screen (similar to a tele-prompter) enabling the operator to conduct the test from a normal driving position in the car. The light beam from the projector passes through a dot pattern on the film and energizes specific photocells. The photocells tell the equipment the test to be performed and automatically sets time delay cycles, amperage or voltage range, etc., for the particular test being conducted.

This procedure provides the following evaluations:

**Measures the power required to operate each electrical device.**

**Places an appropriate load on the system and evaluates performance under load.**

**Locates shorts in systems by use of a high voltage test.**

**Measures time required to perform a test under load. For example, circuit breakers are precisely timed to assure operation within the designated time required to protect the electrical system.**

**Measures system voltage.**

**For performance evaluation, provides two stable states of power voltage to the vehicle being tested. One voltage simulates static car conditions (12.6 volts), the other voltage simulates dynamic car conditions experienced while driving (15.0 volts).**

**Measures engine rpm.**

**Measures distributor advance.**

**Provides a radio frequency signal with a constant tone to evaluate radio function.**

The 12-mile road test, however, supplies the most important evaluation of car acceptance. Following all of the preliminary inspections on and off the assembly line, each car is driven first on the small track within the plant area, then for a 12-mile check-out procedure on the public highway.

Due to the nature of the road test as well as the possibility that further adjustments or repairs may have to be made, the cars are not fully trimmed when they first come off the assembly line. In fact, only the front seat is installed. None of the door trim or rear carpeting or rear seats is in place for this run. By this means it is possible to make all of the necessary repairs or adjustments without injury to trim items, thus dispensing with the usual cleaning of upholstery.

During the course of the road test, which is conducted by a trained driver, the car is subjected to a lengthy sequence of established checks, using a printed form on a clip board. Among other things, it includes observation of the behavior of brakes and steering; engine and transmission performance; horn, lights, and radio; heating and air conditioning systems. Besides this the operator listens for rear axle noise as well as noise and squeaks. It may be appreciated that the test for noise and squeaks is particularly severe when you consider that the body is not yet fully trimmed.

When the road test has been completed, the operator delivers the car to the repair line together with his clip-board notes. All of the corrections then are made and the car is taken out once more, this time for a run around the test track to be sure the corrections were properly made.

It is noteworthy that some extensive testing was done before the onset of production to determine the best compromise for the duration of the road test. Road testing was performed at a variety of mileages, the 12-mile run being adopted as providing the best procedure. It may be noted too that each road test takes about 35 minutes for the initial run.

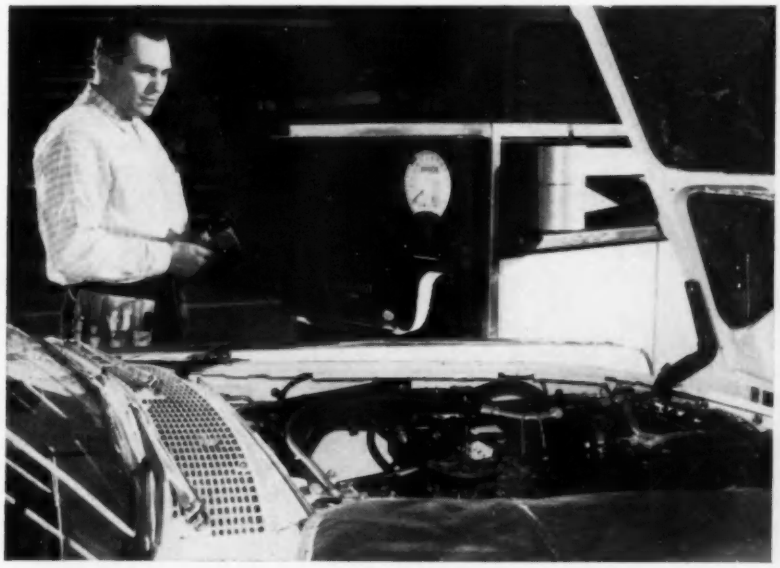
Upon completion of the test run and acceptance of the car by the test driver, the car is driven over another line with a brightly lighted pit. Here the operators tighten body bolts to the specified torque limits, inspect all pre-lubricated joints for evidence of leakage. This then concludes the final mechanical operations required to place the car in shape for delivery.

Supplementing the variety of routine inspections mentioned earlier, the plan also conducts the Quality Evaluation of cars on the line on a sampling basis. At present the sample is 10 cars per shift. That is to say, 10 cars are picked off the line at random during each eight-hour shift, taken off the line to the inspection station. Here again there is an established routine of checking a variety of things including a torque inspection of important fastenings such as body bolts and suspension fittings. Any evidence of lack of control arising from this inspection is cause for inspecting every car on the line.

Even the foregoing inspections are not considered sufficient. There is a final door inspection of every car before it is cleared for delivery to a dealer. ■

***Illustration at right shows a test driver completing the check list on one of the cars on the 12-mile road test***

***Below—The EAGER console connected to a car for the check-out of the entire electrical system***



# AUTOMATION NEWS REPORT

**AUTOMATIC CONTROLS**

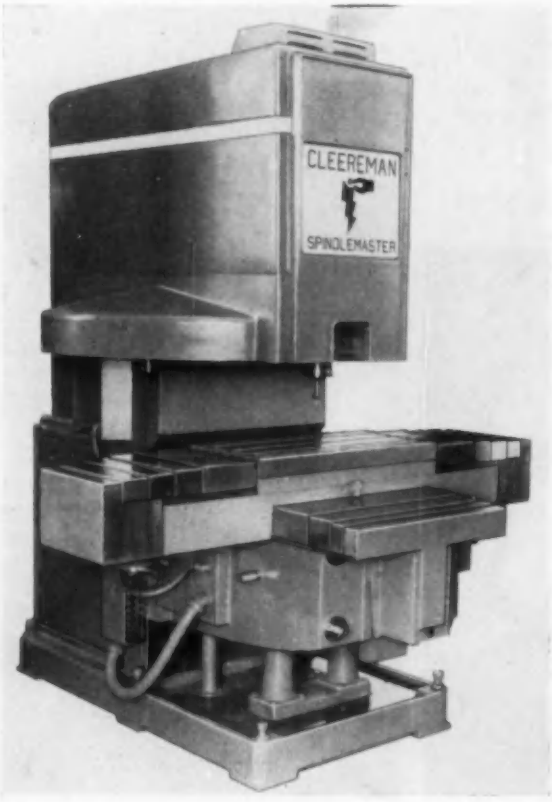
**PRODUCTION—VEHICLES—AIRCRAFT**

**By C. J. Kelly**
ASSISTANT EDITOR

## AUTOMATED MACHINE TOOL FOR MULTI-OPERATIONS

Many high production features are incorporated in a new machine tool designed and built by the Cleereman Machine Tool Company, and available from their general distributors, The Jackson-Fotsch Company. Known as the Spindlemaster, this unit will make tool changes automatically in less than 8.5 seconds and select any of thirty tools from a magazine while the table is positioning for the next operation—all by numerical control. Such operations as boring, drilling, reaming, tapping and milling can be performed with the new unit.

Through tape commands, it will position three axes—single spindle and compound table, control 18 spindle speeds ranging from 150 through 3125 rpm. There are 98 spindle feeds that can be tape controlled from 0.4 to 19.8 in. per minute.

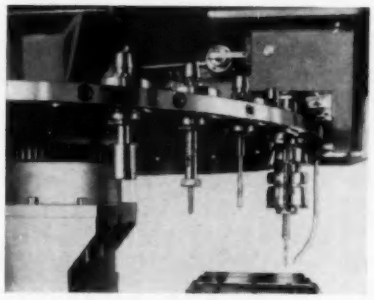



*In addition to automatically controlling the actual machining of the work piece, the special control that was designed for this machine tool will also activate the coolant cycle, control the type of operation and reverse the spindle table where called for.*

The spindle cycle is predicated on the operation mode called for. For each operation mode, machine functions occur in a sequence consistent with the operation to be performed.

For the boring operation mode, two kinds of spindle cycles can be called for. Upon reaching depth, the boring tool can be either withdrawn from the workpiece at the power rapid traverse rate, or direction of feed can be reversed, without reversing direction of spindle rotation, to retract the tool at the same feed rate at which it is fed down. For precise work, the ability to feed up as well as down produces a better finish, more accurate hole size, and eliminates spiral tool marks.

To provide a variety of working heights, the table and carriage are mounted on an adjustable knee with twin raising screws to prevent deflection. The table has 8 in. of vertical adjustment in 1 in. increments. A tape command illuminates one of eight lights on a height setting gauge located at the left side of the knee to indicate which table height position is required.



The Spindlemaster was designed especially for numerical control and the control designed especially for this machine. Manual pushbutton controls are optional and duplicate all tape control functions.

The Spindlemaster has a spindle travel of 9.999 in. The table measures 30 by 16 in. and has a travel of 24 by 16 in. Other specifications include a part clearance of 18 in. maximum from the table to the turret and a maximum part size of 18½ by 30 by 16 in. wide. The maximum tool diameter that can be employed with this machine is 4 in. ■

# ASBE Holds 15th Annual Technical Convention

THE broad spectrum of subjects touching on the art of the autobody engineer and stylist was well covered by the variety of papers presented at the 15th Annual Technical Convention of the American Society of Body Engineers (ASBE) held in Detroit in October, 1960. The papers were so full of meat and so well documented that this report necessarily is confined to comments on a selected group of subjects.

**By Joseph Geschelin**
DETROIT EDITOR

## Reduction in Weight of Cars

Reduction in weight has occupied the attention of engineers for many years and has become even more crucial what with the introduction of compact cars. H. L. Browne, Ford Motor Co., emphasized in his paper on weight control that light-weight bodies "can provide lower initial costs, lower operating cost, and better performance without sacrificing comfort or roominess." According to Browne, the first step in an effective weight control program is the development of a weight target considered attainable by all of the responsible design groups. The second step is an analysis of clay model proposals. Some of the weight implications of a clay model are obvious: larger or smaller bumpers; more or less glass area; longer or shorter overall length. In addition, there are hidden features that must be visualized by the skilled practitioner.

The third step is an analysis of body structure proposals, particularly of rough sketches and partial layouts for the inner structure. They look for the weight of parts not shown but required for the structure, seeking the weight implications of hidden details before design is frozen.

The paper is replete with examples in each area to show that attention to details can be instrumental in reducing overall weight.

## Aerodynamics in Body Design

The role of aerodynamics in body engineering was covered in detail by Morgan W. Dawley, Chrysler Corp. He concludes that aerodynamics will play a greater role in "the shaping and functional design of cars of the future as the refinement of the automobile continues and as superhighway systems are developed which permit higher sustained speeds."

Without going into the analysis developed by the author, we can summarize the scope and influence of car aerodynamics as follows:

**Air and dust leakage**
**Wind resistance, stability, and lift**
**Engine cooling air inlet and exit**
**Body ventilation inlet and exit**
**Wind noise**
**Brake cooling air**
**Exhaust gas dispersion**
**Dirt accumulation**
**Windshield wiper air forces**

The paper discusses each of these items to bring out its implications for the stylist and body engineer.

## Safe and Comfortable Seats

After all the car must be designed for the comfort of people. This aspect was covered by John Versace, Chrysler Corp., in a paper entitled "Human Engineering the Seat." Here the author deals with the gamut of factors contributing to safe and comfortable seating. While the problem is one of great complexity, it is further complicated by the need for designing a standard seat which will suit the greatest percentage of customers.

The author considers this point in discussing what is the "average" man, then in terms of "percentiles." Finally he arrives at a design that can accommodate 94 per cent of sizes, leaving only six per cent that may not be comfortable.

In this connection we refer the reader to the development of the Dreyfus seat design described in AUTOMOTIVE INDUSTRIES, November 1, 1960.

## Advantages of Aluminum Bumpers

Aluminum bumpers have been talked about for several years and were the subject of a paper at this meeting by Paul R. O'Brien, Reynolds Metals Co. Reynolds has selected extruded aluminum bumpers as the most satisfactory approach for replacing steel bumpers. This decision is based upon the following advantages claimed for extrusions:

**Weight reduction**
**Greater leeway in design and styling features**
**Fewer manufacturing operations**
**Better structural and spectral qualities as well as corrosion resistance**
**Cost savings**

O'Brien claimed that an aluminum extruded bumper can produce greater strength and yet yield an average weight saving of 50 per cent when compared with steel bumpers. Moreover, with proper design, the aluminum bumper should make for a cost saving of 10 to 15 per cent when compared to a similar chromium-plated steel bumper. (*Turn to page 72, please*)

# 10th Annual Aircraft Hydraulic Conference

By Joseph Geschelin
DETROIT EDITOR

DEPARTING from the format of previous meetings, the 10th Annual Aircraft Hydraulic Conference sponsored by Vickers, Inc., which was held early in November, 1960, was concerned primarily with prepared papers dealing with jet airline operations and aerospace fluid power systems.

## Improved Reliability and Performance

If one were to over-simplify the contributions of the three-day conference, it would be fair to generalize that component manufacturers as well as the designers of aircraft and space vehicles and missiles are working jointly to improve the reliability and performance of their products. Reliability is by all odds one of the most important characteristics in vehicles comprised of hundreds of thousands of components and parts of all kinds. A fluid leak, a broken line, or a seal failure may well doom the success of a flight involving millions of dollars of investment.

The meeting demonstrated that although problems do exist, joint action has served to reduce their incidence and fixes have been developed to eliminate the most prevalent. Even more important is the fact that component manufacturers such as Vickers are constantly at work on the improvement of the state-of-art and are reaching out for still better components for future applications.

## Long Range Transports

Major features of the hydraulic system for the Vickers VC-10 long range jet transports were described by G. Bannister of Vickers-Armstrong, Ltd. This plane has not yet been test flown and is undergoing systems testing. The flying control system of this vehicle is fully power operated without manual reversion. To this end, the control surfaces—four ailerons, four elevators, and three rudder sections—were split into two systems each one provided with an individual, self - contained electro - hydraulic power pack. The common link—the electrical supply—in turn was split to provide two generators for each system, capable of cross coupling under failure conditions.

The hydraulic system too is split, consists of two separate and equally powered systems. The fluid is Skydrol 500A; maximum working pressure is 3000 psi.

Supplementing the main hydraulic systems is a ram air turbine unit, the emergency source of power for one of the hydraulic systems.

The paper describes in detail the general arrangement of the entire system.

An evaluation of the hydraulic system of the Convair 880/990 was provided by H. E. Wright of Convair. Some impression of the size and complexity of such systems for a modern jet transport may be gained from these facts: the system weighs about 3000 lb; has about ½-mile of tubing with some 600 joints; involves around 250 components; and about a barrel of hydraulic fluid. There are two continuously operating closed center hydraulic systems, each powered by two engine-mounted pumps.

## Problem Areas

Following inauguration of passenger service, Convair found four problem areas requiring correction: in pumps, in the tubing, in special fittings, and in the hoses. Each of these failure areas was studied and within a short space of time the necessary corrective action was made. One example of this was in connection with hose failures. Here the hose installation was altered by providing more ample bend radii; and the low quality hoses were replaced by the supplier. Convair has concluded that on the basis of initial service and consequent corrective action, the overall design philosophy has proved to be very sound.

Noting that the electrical feedback system has shortcomings and disadvantages, L. K. Schwab of The Martin Company, described the development of a mechanical feedback actuator which is completely non-electrical. Schwab feels that this application should result in greater reliability and operational effectiveness.

Details of the double-integration hydraulic serve system for controlling the firing tail turret of the B-52 were outlined by D. J. Mager of the Arma Division at Cape Canaveral. Because design data on this vehicle were classified up to a short time ago, it must be appreciated that system complication is due to design philosophy of some 10 years back. Nevertheless, the author emphasized that the control system made it possible to destroy fast moving targets without a miss.

Mager made a point of the fact that with the current developments in design of components, it should

(*Turn to page* 64, *please*)

# METALS

*Steel Production Rate Expected To Fall Off During the Fourth Quarter of the Year Because of Seasonal Slowdown*

*By William F. Boericke*

## No Improvement in Steel Demand

Steel demand shows little signs of improvement as the fourth quarter nears an end. In mid-November steel executives reported nothing in sight to indicate an upturn was approaching. It would be no surprise if business in the fourth quarter fell behind the uninspiring previous quarter. The production rate usually drops off seasonally in the final month of the year, because of slowing down of construction activity as cold weather arrives. Some mills may close down entirely over the Christmas holidays. The operating rate, approximately 52 per cent, is unlikely to change for the rest of the year.

## Slow Rate of Buying by Detroit

The major disappointment has been the slow rate of steel buying by the automobile manufacturers. True enough that the assembly lines in Detroit are busy, but the emphasis is on compact cars which require less steel than the standard models. There are other reasons as well for Detroit's laggard orders. The automobile companies appear to be trying to convert their inventories into finished cars before the year ends to improve their cash position. There's a rainbow in this; if they succeed in doing so, it should pave the way for a sharp rate in steel demand early in 1961.

In spite of the sadly low operating rate, there are a few cheerful signs. The order volume from diverse industries appears to be increasing. Without doubt actual steel consumption is considerably better than the operating rate would indicate. Inventory cutting continues and it is estimated that customers have recently taken a million tons more from already depleted stocks. If this had come from current production it would have boosted the operating rate 10 or 12 points. which would have shown upwards of 62-65 per cent instead of 52 per cent.

## Some Producers Operate Profitably At Low Capacity

It is also gratifying to see that the larger fully integrated producers are able to operate with a little profit at half capacity, a performance that would have been derided a few years ago. But it's not a case of waiting for orders to be telephoned in. Competition is extremely severe. Every device to coax a customer is used except direct base price cuts, but as a practical matter it may amount to this. Freight absorption is rife. Charges for extras are often overlooked. Standard steel may be offered at a discount, tagged as off grades, but with no perceptible difference except price. Delivery is made from mill stocks, bypassing the warehouses. Fast delivery gets the order, but emphasis is placed on quality of steel as well. The longer guaranty now extended by the automobile manufacturers calls for this.

## Scrap Steel Prices Still Slump

The slow steel operating rate has been accompanied by a continued price drop in the steel scrap market. For the last two months prices have been declining and most scrap men see no early prospect of recovery. No. 1 heavy melting scrap has been offered below $30 a ton. This compares with an average price of $39.80 for the first ten months last year. Particularly weak has been railroad scrap, with the No. 2 grade offered as low as $21 a ton.

Inventories of iron ore at the mills and docks have mounted to 71 million tons, although shipments by the Great Lakes fleet come to only about 65 million tons during the year. In consequence of the lack of demand, the shipping season came to an early close by mid-November, a full two weeks before the usual date. Besides the slow-down in steel production, other factors include large imports of foreign ores brought in by the Seaway or transhipped by rail from eastern or southern ports, as well as the low price of scrap.

## Better Demand Expected for Aluminum

It now appears that the slump in the aluminum industry has bottomed out and demand is expected to firm up for the rest of the year. But the date for any definite uplift is still pretty much guesswork. A Reynolds executive, after acknowledging that business had signally failed to meet earlier expectations so far this year, declared that some improvement had appeared in October and rates for the second half of 1960 would be better than in the first six months.

But steps have been taken all along the line to reduce moderately the production of primary metal and bring it to a level commensurate with the rate of sales. No doubt, with this in mind, Kaiser has shut down another of the pot lines in its Chalmette plant and since July has closed four of the potlines at its Mead plant to adjust plant inventories. Alcan has cut back two potlines at Arvida and reduced its operating capacity to 80 per cent. Company

(*Turn to page 54, please*)

# Electronic Control of Inventory

## *Cuts Obsolescence and Back Orders*

**By Don A. Siegel**
**Secretary-Treasurer**
Hastings Manufacturing Co.
Hastings, Mich.

OBSOLESCENCE, one of the major problems in the manufacture of replacement parts, is being considerably reduced at Hastings Manufacturing Company, and customer service greatly improved, by the use of a random access data processing system for inventory control and other tasks.

In addition, back orders have been cut 75 percent because this equipment gives vital inventory figures daily, instead of every six weeks as in the past.

Yet, we have achieved this, plus improvements in sales analysis, production forecasting, order writing and billing, payroll and labor distribution, and production of commission statements for salesmen and warehouses—all without additional cost.

**How Company Operates**—The Hastings Manufacturing Co. produces piston rings, for the replacement market only; oil filters spark plugs, automotive tools and Casite additives.

Our general offices, four plants and three warehouses are in Hastings, Mich. We also have a wholly-owned subsidiary plant-warehouse in Toronto, Canada; three other warehouses in Canada; and 19 public warehouses in the United States.

In addition, we do a large consignment business in rings, with jobbers. We have our own sales force, with seven geographic divisions, to contact the jobbers. Any business with the larger automotive chains is handled directly from Hastings.

Despite rapidly increasing volume in oil additives and filters, piston rings are still our biggest selling products. We manufacture about 9000 engineered sets of rings, which include about 25,000 finished parts. About 200 of these sets account for 80 percent of our sales volume in rings. The rest we consider "service items."

Consequently, obsolescence has always been a headache. The key to reducing it has been the establishment of an inventory control system accurate and up-to-date enough to permit operating with minimum balances, and "sophisticated" enough to help us spot trends and plan ahead properly.

**Benefits of Electronic System**—This, we have now achieved through the use of an IBM RAMAC 305 Data Processing System. Its installation has enabled us to consolidate our machine accounting department, building the installation around the system itself.

In the past, the information we received was accurate enough, but bordered on ancient history. A complete inventory report was only available every six weeks.

*The author, Don A. Siegel, Secretary-Treasurer, Hastings Manufacturing Co.*

Now we get a much more detailed report every two weeks. And, most important, we get an exception report daily, showing us shortages, reorders, and overages. It includes all the facts we need to know in a hurry on inventory of both finished parts, such as individual rings; and finished products, complete, boxed sets of rings. This takes in all inventory here in Hastings — rings, filters, plugs, and additives.

In addition, the random access feature of the RAMAC enables it to print out on its console typewriter an immediate answer to an inquiry about the inventory status of any specific item.

Thus, the machine enables us to keep adequate, but minimum, supplies of parts and products available. On the one hand, this reduces obsolescence due to overstocking; on the other, it reduces shipping delays due to out-of-stock conditions.

**How System Works**—The key to the effectiveness of our system is a parts "explosion," or bill-of-materials breakdown.

To handle incoming orders, we have files of customer name and address cards and item cards. When an order arrives, we pull these header and item cards and put them through an IBM 407 Accounting Machine to write the shipping order.

The item cards then go through the RAMAC 305 to reduce the finished product inventory figures in its disk storage. This stack of revolving, magnetic-coated disks has a total capacity of five million digits of information.

If any of the cards causes the inventory to drop below a certain

point—usually a 60-day supply—the machine punches out a shortage card. This includes a complete activity report on the product since the last bi-weekly inventory report, its 12-months' sales record, and current requirements.

We feed shortage cards like these through our accounting machine to produce our daily shortage reports.

Then, we run these same cards through the system again to "explode" the bill-of-materials, for the finished product, also in the disk storage. The RAMAC 305 produces a card showing the number of days' supply on hand for each finished part involved in the finished product. These cards also are put through the accounting machine to give us a printed report.

From these reports and cards, our Production Department writes production orders for parts in short supply. It then returns the cards to the computer section with the quantities ordered written on them. These quantities are punched in by an IBM card punch operator, and the cards are fed into the machine to cancel the shortage by adding to our "on order" inventory. The cards are then filed in our "on order" file.

This dependence on "on order" inventory is entirely satisfactory, because the RAMAC created the shortage card with a 60-day balance, a safe but minimum figure. So, the lead time before the new production is completed is entirely adequate.

As soon as the items are produced, the "on order" cards are removed from the file and fed through the machine again to reduce "on order" inventory records and add to finished parts inventory.

To replenish finished products, copies of the shortage cards and report, mentioned earlier, go to the packing foremen. He, or she, creates production orders and packs first what is needed most, based on the number of days' stock on hand as shown by the report.

(*Turn to page* 64, *please*)

***After being fed through an accounting machine to print shipping papers, the cards go into this IBM RAMAC 305 Data Processing System to update inventory cards on its disk storage unit at right rear. If this drops supplies of any item below a minimum balance, a shortage card is produced by the output unit at left rear.***

***These IBM RAMAC 305 output cards, and others, are run through an off-line IBM 407 Accounting Machine to produce inventory reports. Shortage cards are run daily; a complete inventory report is prepared bi-weekly.***

***The random access nature of the IBM RAMAC 305 means that it can answer a direct "question" on the status of any information stored in its disk file. Here, the console typewriter is printing out the inventory balance of a 'hot" item.***

# METALS

(*Continued from page* 51)

officials noted that while sales have exceeded 1959 thus far, stocks have continued to mount. Reynolds proposes to close down a reduction plant in Arkansas unless business improves. The decision to close was dictated by a national rather than a local condition of over supply.

## 1960 Shipments To Show No Increase Over 1959

The chairman of Alcoa is quoted as saying that domestic shipments in 1960 will run 5 per cent under 1959. This view is endorsed by other executives. Shipments have been held down by a concerted move by consumers to cut their inventories of metal, precisely the same as has been witnessed in steel and copper. However, inventory cutting, which has been most severe with manufacturers of hard goods, is expected to be cleaned up by the end of the year.

## Price Increases Unlikely

The price situation for aluminum products remains unhappy. There is very little chance for a hike in aluminum ingot while the export price of U. S. primary metal C.I.F. foreign ports is 2¾ cents less than the domestic. Competition within the industry is exceptionally severe. Modest increases of ½ to ¾ cent posted in August have failed to stick in some instances. Prices of siding have slipped back to the old level. Price shading has been especially severe in the container field, where aluminum coil has had to meet competition from U. S. Steel's new thin tin plate. In an effort to develop a large volume of business producers have set prices lower than for other aluminum products.

## Copper Strike Settled in Chile

Settlement of the 6 weeks strike at Anaconda's Chuquicamata mine in mid-November brought to an end one of the main factors for outside strength in the copper market. The work stoppage caused the loss of some 36,000 tons of production and before production can again become normal, the loss will exceed 45,000 tons. This is about 1.5 per cent of the world production of refined copper.

## Slow Domestic Buying

Copper buying has been undeniably slow for domestic consumers and the 3-cent cut has failed to generate much new business. Nevertheless, the 30-cent price is likely to hold. Scrap prices have been stronger and have advanced to 23¼ cents a pound, equal to 28¾ cents for refined metal deliverable 90 days hence.

Brass mills report no change in the dreary outlook and fabricators continue to be hurt by imports from abroad offered at prices below the market. Phelps Dodge Copper Products regretfully announced a price reduction for some of their copper cable through increased discounts on quantity purchases that amount to a 12 per cent cost reduction to buyers.

## Zinc Stocks Reduced for Third Month

October figures from the Zinc Institute showed stocks down 2000 tons from September, continuing the improvement for the third consecutive month. At the end of October stocks totalled 190,288 tons. A years ago they were 191,-251 tons. While shipments to domestic consumers rose about 400 tons, exports declined, leaving total about 3000 tons below September. Special High Grade was in demand. The cumulative total of shipments for the January-October period was 698,000 tons, about 27,000 tons less than in the same period of 1959. The price remains firm at 13 cents East St. Louis, but it seems a little doubtful if this can hold if the strikes at the New Jersey Zinc Co. mines and in Idaho terminated.

## Lead Featureless

Lead sales show little change. Business in the first half of the month is usually slow, then picks up in the later weeks, with buyers coming in for heavy average purchases. The 12-cent price seems likely to hold. Shipments of replacement batteries have picked up but are still below last year's figures. Domestic stocks are about the same, but are about 18 per cent higher than last year. ■

### Smith Research Center

A. O. Smith Corp. plans a $2 million advanced research center at Middleton, Wis. L. B. Smith, president, said the center will be located on an 80-acre site. Completion of the 50,000-sq ft building is expected in mid-1961. The laboratory will be devoted to advance research in the physics and chemistry of materials and the energy processes involved in the utilization of materials.

### M&T Enlarges Laboratory

Metal & Thermit Corp. has established an enlarged laboratory in Detroit for electroplating analytical and technical services. The laboratory headquarters a technical staff qualified for field consultation on electroplating problems. Peter G. Kenedi is laboratory supervisor.

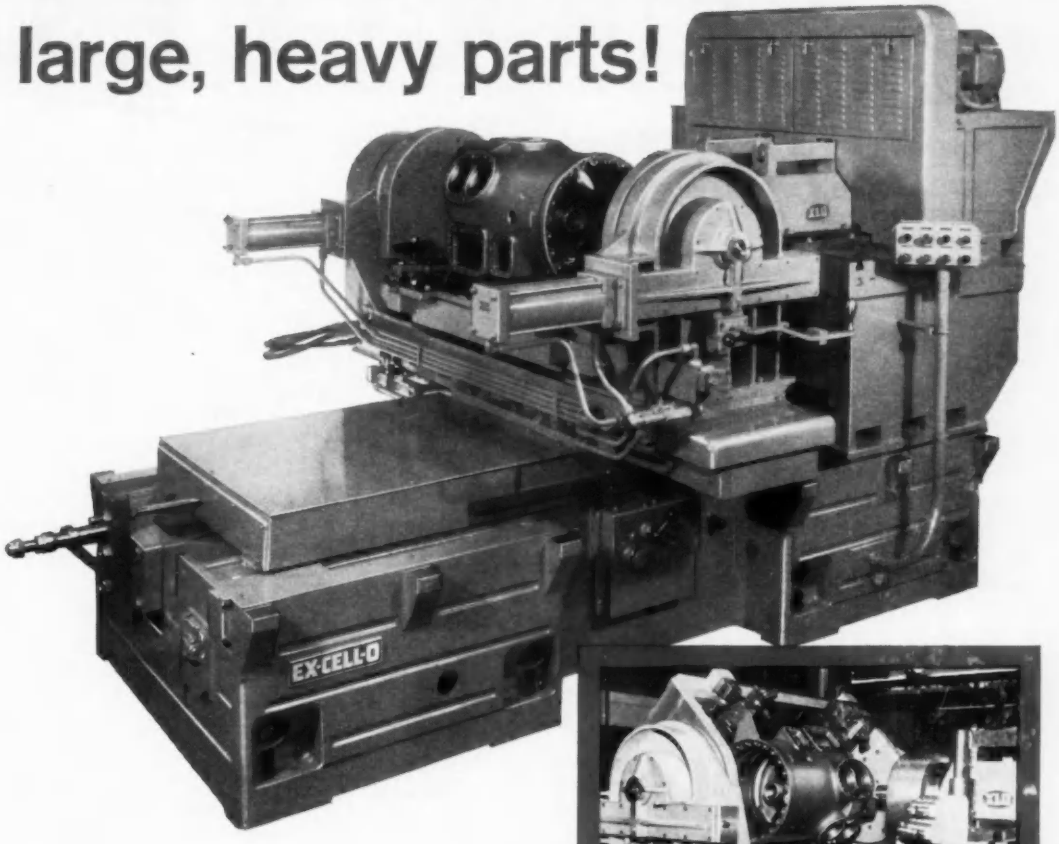
### Mobile Trade Fair Plan

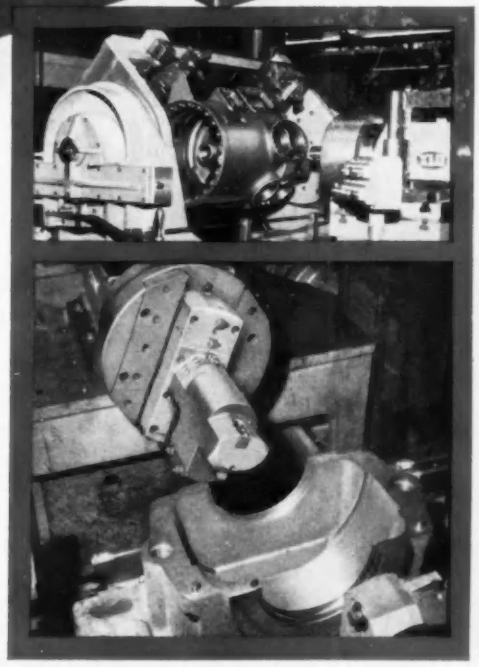
The Isbrandtsen Co., Inc., a steamship line, is urging American manufacturers to join President Eisenhower in a drive to "beef up" our export trade. All expenses of shipping and exhibiting U. S. products will be borne by the steamship line. Officials say the idea can go a long way to help U. S. concerns regain their places in world export trade. Eight exhibits can be accommodated in each large container.

### Enjay Office Moved

The Enjay Chemical Co. has moved its Detroit Automotive Development Group from 16301 W. Seven Mile rd. to 17360 W. Eight Mile rd., Southfield. Enjay's Southfield staff is headed by C. A. Coffey, manager. It is responsible for the development of new uses of Enjay products in the automotive industry.

# STANDARD EX-CELL-Os
## for large, heavy parts!



- Accuracy, heavy cuts and good finishes on large parts are the high-production features of Ex-Cell-O Models 771 and 772 (double-end) Horizontal Precision Boring Machines
- These precision-built workhorses have husky nickel cast-iron bases with wide-spaced ways, extra-strong tables to handle the heaviest fixtures and workpieces, and infinitely adjustable hydraulic feeds in both directions for maximum cycling efficiency.
- A range of standard spindles, bridges and drive equipment lets you custom-equip Models 771 and 772 to suit your particular precision boring, turning, facing, grooving and chamfering operations.

Contact your Ex-Cell-O Representative or write direct for details.

Typical of parts handled by Models 771 and 772 are large air conditioning compressor housing castings (main illustration and close-up above), and cast-iron pillow block bearing support housings (bottom photo). Machine takes ⅝" cut as it roughs, finish-bores, and generates interior form of support housing in a single cycle.

60-25

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PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

*Machinery Division*

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN



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# AIR BRIEFS

By R. RAYMOND KAY
PACIFIC COAST EDITOR

## Huge Gliders

How to transport big rockets from factory to launch site. That's a problem that the Air Force and the aerospace industry must soon solve. Lockheed Aircraft thinks it has the answer—huge gliders.

The new rocket stages are too large for normal delivery methods. That is, by rail or over the highways. Right now, barges are used. But this is costly and has a lot of drawbacks. For example, you need a navigable water link between the manufacturer and the launch site. This method is expensive in terms of transit time, cost of barges, and docking facilities.

Lockheed's plan: mammoth gliders with a 211-ft wing span and a 110,000-lb payload. The interior would be 96 ft long with a 24 ft diameter. That's large enough to take care of stages of the eight-engine Saturn.

The gliders could be towed by present day cargo planes and operate from most airfields, Mark J. LaFrom, Lockheed engineer says. They could deliver their rocket cargo in a few hours. Today, transit by barge takes five to 20 days.

"The number of gliders required would be only a fraction of the number of barges needed for the same job. And a glider can be built at a cost favorable to that of a barge," Mr. LaFrom points out.

## Automatic Brazing Process

Norair Div. of Northrop Corp. has an Air Force contract for Nortobraze, its automatic brazing process. The company will adapt this process to the manufacturing of stainless steel honeycomb panels. These are for hypersonic aircraft and space vehicles.

Nortobraze uses electronically-automated radiant quartz lamps to braze stainless steel and the "space metals" in two to 15 minutes. Its process, Northrop reports, drastically cuts tooling costs.

## Manned Space Plane

A manned space plane by 1970? Sounds Buck Rogerish, but Convair, Douglas, Lockheed, and North American are working on it. In fact, Lockheed has been at it for over a year.

There's talk in the aerospace industry that the Air Force will ask for an initial $20 million in fiscal 1962 for this project. It could become one of the Air Force's largest and most important.

The companies involved won't talk. But it's reported that the space plane would take off by its own engines. It would be our first manned vehicle able, under its own power, to propel itself from earth into orbit and back to earth.

The Army is looking for a missile system that could move with its units in the field and protect them from a variety of enemy missiles.

The Martin Company's Orlando division and W. L. Maxson Company, New York, is one of the six teams of industrial firms asked by the Army to work on the project. Each team has a $250,000 contract to make a study.

## Tooling and Equipment

Aerospace industry tooling and equipment engineers predict:

(1) Continuing evolution toward limited quantity production. Inherent in this is narrowing of the amortization base.

(2) Less and less time for manufacturing development.

(3) Need for high strength, high temperature materials. These will be worked to ultra-close precision, thinned to minimum weight, and produced in small quantities.

That's a look ahead of Five Technical Committees of the Aerospace Industries Association.

More AIA forecasts:

During the next five years we'll have high-yield alloys (to 350,000 psi) in sheet and bar form only. To minimize rising costs, sheet forming equipment will have to make parts closer to final configuration. There will be advances in high energy forming, precision and spin forming, extruding, casting, and deep drawing.

Aerospace industry companies are stepping up the use of numerically controlled machine tools. Aim: To reduce the cost of fabricating tooling and production parts. The next three years will show great improvement in three dimensional programming. Credit for this goes to Air Force/AIA-sponsored Automatic Programming Tools system.

Look for use of numerical tape control in lofting, drafting, testing, inspection, and system checkout. The industry will apply preprogrammed data to an integrated system of manufacturing, from design concept through the final checkout of weapons systems.

The aerospace industry needs a method of joining metals without heat. It must look into how to weld fibrous materials used for transpiration cooling; and how to weld refractory metals to dissimilar metals, and metals to glass. ■

# INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

## WEEKLY U. S. MOTOR VEHICLE PRODUCTION

*As reported by the Automobile Manufacturers Association*

| Vehicle Make | Weeks Ending Nov. 12 | Weeks Ending Nov. 5 | Year to Date 1960 | Year to Date 1959 |
|---|---|---|---|---|
| **PASSENGER CAR PRODUCTION** | | | | |
| Total—American Motors Corp. | 8,350 | 10,705 | 420,375 | 342,463 |
| Chrysler | 1,759 | 1,717 | 75,286 | 60,977 |
| De Soto | 256 | 232 | 18,901 | 38,377 |
| Dodge | 5,067 | 6,077 | 339,545 | 161,327 |
| Imperial | 483 | 604 | 14,701 | 18,792 |
| Lancer | 2,096 | 3,542 | 43,818 | ..... |
| Plymouth | 5,306 | 5,096 | 224,691 | 360,670 |
| Valiant | 3,458 | 2,817 | 213,334 | 7,565 |
| Total—Chrysler Corp. | 18,425 | 20,085 | 930,276 | 647,708 |
| Comet | 4,727 | 4,682 | 175,151 | 29,586* |
| Falcon | 9,192 | 9,417 | 446,976 | 44,666 |
| Ford | 21,406 | 21,872 | 873,592 | 1,271,792 |
| Lincoln | 254 | 517 | 14,851 | 24,788 |
| Mercury | 4,457 | 4,916 | 141,654 | 134,054 |
| Total—Ford Motor Co. | 40,036 | 41,404 | 1,651,224 | 1,504,886 |
| Buick | 6,193 | 6,566 | 232,758 | 209,201 |
| Special | 2,886 | 2,950 | 20,942 | ..... |
| Cadillac | 3,352 | 3,381 | 138,708 | 126,651 |
| Chevrolet | 32,692 | 33,015 | 1,399,814 | 1,252,034 |
| Corvair | 6,323 | 5,598 | 217,835 | 57,025 |
| Oldsmobile | 6,805 | 7,190 | 317,074 | 337,192 |
| F-85 | 2,759 | 2,682 | 23,300 | ..... |
| Pontiac | 6,001 | 6,908 | 373,226 | 360,273 |
| Tempest | 3,017 | 2,600 | 10,789 | ..... |
| Total—General Motors Corp. | 70,028 | 70,890 | 2,732,856 | 2,342,376 |
| Total—Studebaker-Packard Corp. | 1,893 | 2,416 | 95,771 | 134,711 |
| Checker Motors | 111 | 67 | 6,230 | 4,060 |
| Total—Passenger Cars | 138,843 | 145,567 | 5,836,732 | 4,976,204 |
| **TRUCK AND BUS PRODUCTION** | | | | |
| Chevrolet | 7,527 | 8,012 | 347,190 | 304,708 |
| G. M. C. | 1,520 | 1,565 | 91,755 | 70,783 |
| Diamond T | 19 | ..... | 2,298 | 4,949 |
| Divco | ..... | ..... | 3,256 | 3,316 |
| Dodge and Fargo | 1,684 | 536 | 63,249 | 66,554 |
| Ford | 6,003 | 2,751 | 285,233 | 296,532 |
| F. W. D. | 13 | 14 | 788 | 934 |
| International | 1,592 | 2,307 | 109,621 | 128,183 |
| Mack | 273 | 270 | 13,219 | 15,328 |
| Studebaker | 216 | 393 | 11,589 | 10,650 |
| White | 263 | 185 | 14,068 | 17,595 |
| Willys | 1,778 | 1,932 | 111,669 | 98,614 |
| Other Trucks | 80 | 70 | 3,855 | 3,381 |
| Total—Trucks | 20,978 | 18,035 | 1,057,790 | 1,021,536 |
| Buses | 65 | 55 | 3,615 | 2,172 |
| Total—Motor Vehicles | 159,886 | 163,657 | 6,898,137 | 5,999,912 |

*—Edsel Production.

## NEW FOREIGN CAR REGISTRATIONS*

### SEPTEMBER

| 1960 | | 1959 | |
|---|---|---|---|
| Volkswagen | 13,900 | Renault | 9,483 |
| Renault | 4,165 | Volkswagen | 8,705 |
| Simca | 2,010 | English Ford | 3,568 |
| Opel | 1,858 | Fiat | 3,546 |
| English Ford | 1,556 | Opel | 3,417 |
| Triumph | 1,552 | Simca | 3,041 |
| Fiat | 1,520 | Hillman | 2,466 |
| Volvo | 1,375 | Vauxhall | 2,200 |
| Austin Healey | 1,309 | Triumph | 2,153 |
| Mercedes Benz | 1,291 | M. G. | 1,665 |
| All Others | 9,907 | All Others | 13,950 |
| Total | 40,441 | Total | 54,194 |

### NINE MONTHS

| 1960 | | 1959 | |
|---|---|---|---|
| Volkswagen | 115,467 | Volkswagen | 83,161 |
| Renault | 54,061 | Renault | 65,669 |
| Opel | 22,092 | English Ford | 33,272 |
| English Ford | 20,900 | Opel | 30,197 |
| Fiat | 17,538 | Fiat | 29,705 |
| Triumph | 14,523 | Simca | 28,763 |
| Simca | 13,860 | Hillman | 22,609 |
| Austin Healey | 13,743 | Triumph | 18,169 |
| M. G. | 10,949 | Vauxhall | 17,870 |
| Mercedes Benz | 10,857 | Volvo | 14,269 |
| All Others | 103,278 | All Others | 115,408 |
| Total | 397,268 | Total | 459,092 |

## TRACTOR SHIMENTS

### WHEEL TYPE

| Hp. Ratings | September | Nine Months |
|---|---|---|
| 9-34 belt hp. | 847 | 20,792 |
| 35-39 belt hp. | 1,446 | 17,422 |
| 40-49 belt hp. | 1,276 | 24,007 |
| 50-59 belt hp. | 3,620 | 30,746 |
| 60 belt hp. and over | 3,149 | 20,232 |
| Total—Wheel Type | 10,338 | 113,193 |

### TRACKLAYING TYPE

| | | |
|---|---|---|
| 25-59 net engine hp. | 859 | 5,932 |
| 60-89 net engine hp. | 290 | 3,169 |
| 90-129 net engine hp. | 263 | 3,165 |
| 130 net engine hp. and over | 576 | 6,784 |
| Total—Track Type | 1,988 | 19,050 |

## 1960 NEW REGISTRATIONS

*Arranged in Descending Order According to the Nine Months, 1960 Totals*

### NEW CARS

| Make | September 1960 | August 1960 | September 1959 | Nine Months 1960 | Nine Months 1959 |
|---|---|---|---|---|---|
| Chevrolet | 119,484 | 140,595 | 113,097 | 1,295,038 | 1,148,003 |
| Ford | 95,536 | 110,522 | 106,392 | 1,040,092 | 1,106,827 |
| Plymouth | 30,439 | 34,498 | 30,880 | 342,806 | 298,776 |
| Rambler | 31,416 | 37,482 | 27,825 | 327,421 | 274,660 |
| Pontiac | 27,564 | 30,654 | 29,196 | 299,079 | 301,384 |
| Dodge | 21,763 | 28,547 | 11,086 | 278,620 | 110,365 |
| Oldsmobile | 23,907 | 25,359 | 27,097 | 253,734 | 283,463 |
| Buick | 15,357 | 17,837 | 14,759 | 187,866 | 188,027 |
| Mercury | 10,918 | 9,822 | 12,461 | 113,492 | 115,722 |
| Cadillac | 9,469 | 11,135 | 9,213 | 107,851 | 107,495 |
| Comet | 15,761 | 17,708 | ..... | 102,930 | ..... |
| Studebaker | 8,126 | 8,426 | 8,019 | 84,462 | 99,480 |
| Chrysler | 4,653 | 5,629 | 4,924 | 57,444 | 48,133 |
| De Soto | 1,243 | 1,557 | 3,327 | 19,491 | 34,464 |
| Lincoln | 1,266 | 1,396 | 1,692 | 15,839 | 20,476 |
| Imperial | 894 | 1,039 | 1,003 | 11,357 | 12,663 |
| Misc. Domestic | 528 | 617 | 3,269 | 7,139 | 37,219 |
| Foreign | 40,441 | 42,577 | 54,194 | 397,268 | 459,092 |
| Total—All Makes | 458,765 | 525,400 | 488,434 | 4,941,869 | 4,646,249 |

### NEW TRUCKS

| Make | September 1960 | August 1960 | September 1959 | Nine Months 1960 | Nine Months 1959 |
|---|---|---|---|---|---|
| Chevrolet | 22,228 | 26,736 | 21,989 | 242,326 | 250,594 |
| Ford | 25,498 | 24,539 | 27,831 | 220,322 | 219,051 |
| International | 9,207 | 9,419 | 9,343 | 86,270 | 79,105 |
| G. M. C. | 6,960 | 7,745 | 6,280 | 63,349 | 55,169 |
| Dodge | 3,260 | 3,685 | 3,581 | 32,722 | 40,944 |
| Willys Truck | 1,631 | 1,456 | 1,772 | 14,063 | 13,645 |
| White | 978 | 1,095 | 1,419 | 11,541 | 11,684 |
| Mack | 827 | 936 | 1,159 | 8,708 | 10,465 |
| Willys Jeep | 1,033 | 921 | 981 | 7,732 | 6,890 |
| Studebaker | 584 | 600 | 516 | 4,200 | 4,852 |
| Diamond T | 154 | 248 | 262 | 2,041 | 2,138 |
| Brockway | 68 | 73 | 121 | 840 | 859 |
| All Others | 3,644 | 3,987 | 3,793 | 34,499 | 31,399 |
| Total—All Makes | 76,072 | 81,440 | 79,047 | 728,613 | 726,796 |

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

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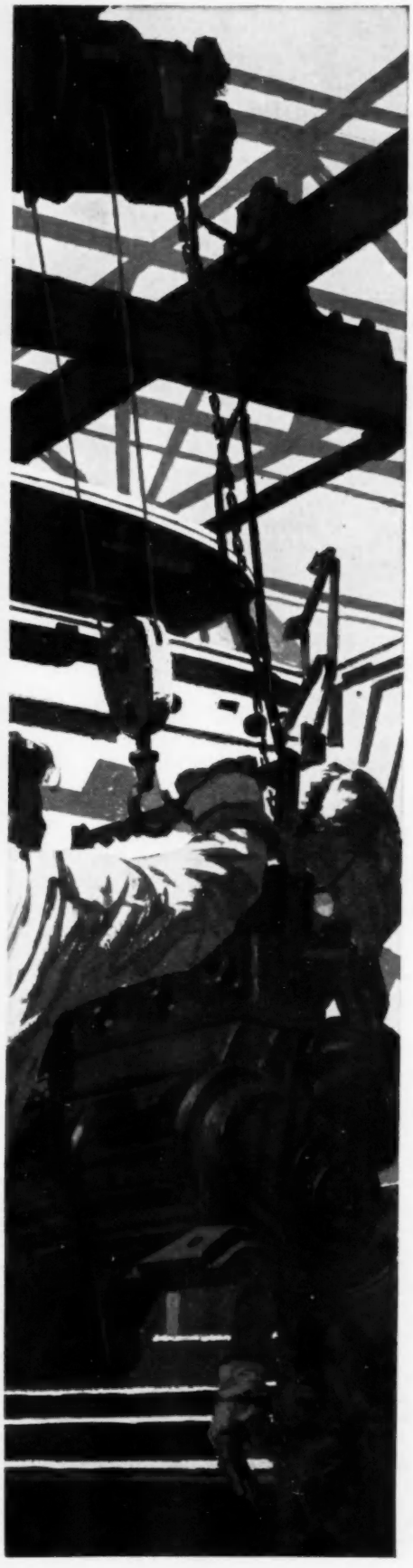


# the strong silent type

Body and chassis welded together into one strong, light, noise-free unit—that's the increasingly popular unit body construction used in many of today's cars. Result—not only the absence of squeaks and rattles but also added strength for extra safety...with less weight.

Budd designed, engineered and constructed the first unit body to be put into production in the U.S.A. in 1939. Its currently growing popularity is proof of the foresight with which Budd facilities are being applied to serve the automotive industry. The Budd Company, Detroit 15.

AUTOMOTIVE Budd DIVISION

*Since 1916—serving the automotive industry with research, design, engineering and specialized production facilities.*



Circle 123 on Inquiry Card for more data

# News of the MACHINERY INDUSTRIES

**Solution to the Shaping of Many Difficult-to-Machine Materials May Lie in the Use of a New Method Employing Electrical Energy Combined with Rapidly-Flowing Electrolyte**

*By Charles A. Weinert*

## New Electrolytic Process Shapes Tough Alloys

"Electro-shaping," by means of a new method, is now being proposed as the answer to removing metal from extremely hard, tough materials.

The new electrolytic process, named "Sifco Shape," was developed by Battelle Memorial Institute through research sponsored by The Steel Improvement & Forge Co., Cleveland. Just announced by its sponsor, the process employs direct current in combination with a rapidly-flowing electrolyte. It is similar in principle to electro-polishing and electro-plating, but with the important feature that the chemical solution is exchanged rapidly and thus supports a heavier electrical current, with consequent higher rate of metal removal.

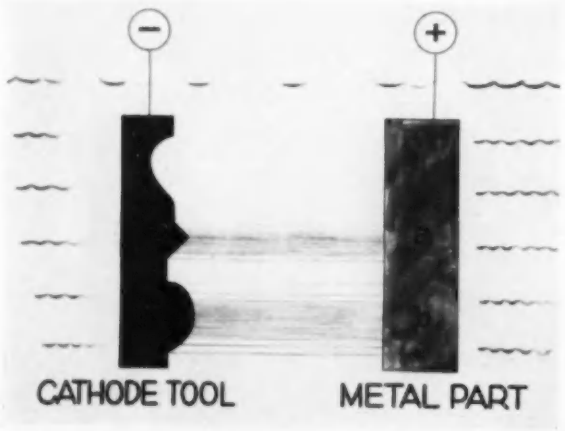
According to Dr. C. L. Faust, chief of Battelle's Electrochemical Engineering Div., the process differs, too, from others which use the electrolytic metal-removing principle. He says it can produce complete parts, in addition to sinking cavities; it uses no rotating cutting wheels; and that its power is supplied through a simple rectifier.

### Principle

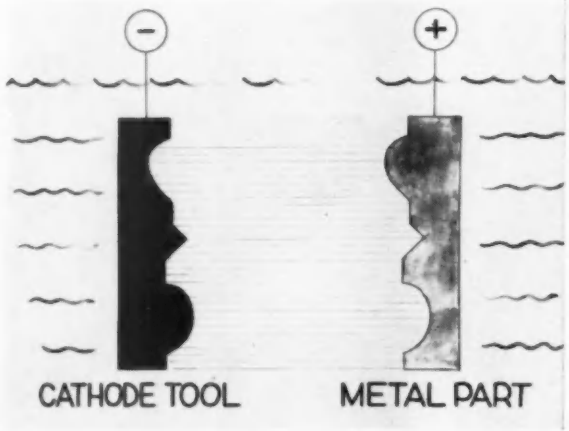
Dr. Faust explains the basic principle this way:

Electro-shaping uses electrical energy to dislodge the surface atoms of the metal, and they are swept away by rapid and controlled flow of a dissolving solution. Thus, the chip-by-chip method of removal is replaced by an atom-by-atom removal procedure. This is done by taking away the negative electrical charges that bind the surface atoms to their subtrate associates in the metal crystal. These dislodged surface atoms are positively charged and are attracted away into the dissolving solution (the electrolyte).

In practice, a cube-shaped plastic chamber holds the workpiece to be shaped, plus two electrode (assuming both sides of the workpiece are to be shaped). The electrodes are formed and sized to the configuration of the final part. The workpiece (anode) is placed between the electrodes (cathodes); electrical energy applied; and the electrolyte pumped under pressure between the electrodes and the workpiece. The electrical energy passing from workpiece to electrodes dislodges the surface atoms of the workpiece, and these surface atoms are carried away by the electrolyte. As the electrical




*Basic principle of "Sifco Shape" electro-shaping process. At the start of the shaping operation, essentially all of the current flow between the electrode (—) and the workpiece (+) is in areas a and b of the latter. Thus, metal removal is mostly concentrated initially in these areas, and the depressions at a and b are started.*




*At the finish stage, the electric current flow lines indicate equal current density at all points, and the intended configuration of workpiece completed. These illustrations picture shaping of only one side of workpiece. In the case of parts with two sides to be shaped, the workpiece is placed between two formed electrodes.*

energy "dissolves" the workpiece to the desired shape, the electrodes are progressively moved in to gradually shape the workpiece to its final configuration.

The formed electrodes, which are not subject to "wear," can be made of any electrically-conductive material. The electrolytes, selected to match the metal being processed, are available commercially.

Current requirements for the process are said to range up to 1500 amp per square inch of workpiece, at 3 to 12 v, to achieve a penetration rate of 0.05 to 0.1 ipm. It is stated, however, that for most operations a current of 100 to 500 amp is sufficient. The rate of metal removal is of course governed by the amount of electrical current applied; and additionally varies with the type of metal and also with the work area being shaped.

### Applications

C. H. Smith, Jr., president of Steel Improvement, sponsors of the process, says his company has had several of the new machines operating on a production basis in Cleveland for a number of months. During this time, more than 15,000 jet engine compressor blades of 16 different designs have been successfully produced, he reports. Mr. Smith indicates that airfoils are being made with leading and trailing edges as thin as 0.005 in., with good contour control, excellent reproduction, and significant savings in machining costs.

Mr. Smith also says that while work to date has been largely centered on electro-shaping forged workpieces, he believes the process is applicable to machining castings and bar stock as well. Other potential applications mentioned by sponsor company officials are turning, die sinking, trepanning, internal helical grooving, milling cut-off, and drilling.

### Availability

The electro-shaping machines—now being built by Steel Improvement at its subsidiary, Custom Tool & Manufacturing Co., Minneapolis—will be specially-designed for specific applications, Mr. Smith said. "Company technicians will be made available to prospective users," he explained, "to review with them particular applications of the new process, and to design prototype units for pilot production of parts in Steel Improvement's own plants. In this way, we can explore and refine the necessary procedures before installing a machine in a customer's plant."

# Meet the AI By-Liners

**A brief biographical sketch of the editors and contributors to AI whose by-lines appear regularly**

## *Introducing*
## Hugh C. Quinn

HUGH C. QUINN, Detroit Regional News Editor, came with AUTOMOTIVE INDUSTRIES in June 1957, with a varied, vigorous, and continuous journalistic background, which includes that of reporter, desk editor, translator, and advertising and sales promotion copywriter.

In his present position on the AI staff he is close to the leaders in the Automobile Capital of the world, in supplying readers with the latest capsuled automotive news from Detroit, Flint, Kenosha, Hamtramck, Dearborn.

Hugh, born in Detroit in November 1929, graduated from the University of Michigan in 1952 with a B. A. degree in journalism. While in school at Ann Arbor he worked as reporter and night editor on *The Michigan Daily*, the student newpaper. He also served as a stringer for both United Press and International News Service. He joined the U. P. Detroit Bureau in 1951 as a full-time reporter-rewrite man.

After receiving his degree he went to Mexico City in 1952, and joined the staff of *The News*, an English-language daily newspaper, where he served as reporter, desk editor, and translator.

On return to the States he spent three years at American Motors Corp. writing advertising and sales promotion copy for the Kelvinator Export Division. He left in 1956 to join the Automobile Manufacturers Association as editor of the monthly *Automobile Facts;* did publicity and other public relations type work for the 42nd National Auto Show in '56.

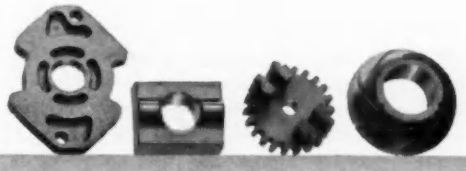
Hugh, still single, engages in hobbies centering around music, when there is time. He is percussionist with three or four amateur symphony orchestras, including the Scandinavian Symphony, Grosse Point, and Allen Park orchestras.

He is a member of the Detroit Press Club.

**NEW**
**MODEL?**
**NEW**
**PRODUCT?**

# NOW'S THE TIME TO EXPLORE NEW SAVINGS WITH DELCO MORAINE SINTERED METAL PARTS

Designing or redesigning a product? Look carefully at components. If they're needed in quantity, Delco Moraine sintered metal parts may offer important advantages in cost, operating efficiency and improved reliability. It may be possible to design a single sintered part to replace a sub-assembly of several parts. Or eliminate the need for expensive machining operations. Or provide a special characteristic to lengthen product life, or improve performance. The controllable porosity of sintered metal parts, for example, permits impregnation with oil for lifetime self-lubrication. Give your new model or product every production break you can. Show components to engineers from Delco Moraine, a leader in the industry for forty years. They know when and how sintered metal parts can best be used. It's to your profit to know, too—and the best time to find out is now, in the planning stage.



DELCO MORAINE

*Division of General Motors, Dayton, Ohio*



Circle 124 on Inquiry Card for more data

# 10th Annual Aircraft Hydraulic Conference

(*Continued from page* 50)

be possible to make significant changes and refinements in the system he described.

The flight control actuation system for the first submarine-launched Polaris missile was described by J. Hecht of Lockheed. He pointed out that the lessons learned were instrumental in the development of the next generation Polaris. The newer system is lighter, easier to install, and capable of handling even greater loads.

## Tests for Hydraulic Components

Individuals and organizations responsible for the design and development of space vehicles are naturally concerned with the uncertainties of outer space environment. One of them, M. Ogman of Convair - Astronautics, suggested some failure tests to discover what may happen to hydraulic components. Here are a few examples:

**Complete or partial loss of accumulator precharge**
**System performance with air in the oil**
**System performance with controlled external leakage**
**Loss of variable volume pump pressure compensation**
**Reduced voltage on motor-pump units**
**What is the effect of oil contamination**

These and other tests must be devised, in the opinion of the author, in an effort to advance the state of the art in the field of missiles.

## Non-Propulsive Power

An appraisal of auxiliary power —non-propulsive power—systems was presented in a voluminous package that defies condensation. The first section, prepared by H. J. Howard and H. S. Markarian of Vickers is a review of the battery, hot gas, and inertia wheel power systems for missile boosters. Included is a brief description of the advantages and disadvantages of each system; a comparison of the three types; and a detailed study of the most promising system—the bleed gas A-C system.

The second section, presented by N. M. Fruktow and J. J. Ventura of Space Technology Laboratories, Inc., discusses an inertia wheel power supply for a hypothetical manned space vehicle, includes a system for booster application as well as for the manned re-entry vehicle.

## Development at Vickers

As usual Vickers mustered an impressive array of its own top engineers to participate in discussion as well as in the presentation of papers on pertinent subjects. One example is in the application of fluid power systems for supersonic aircraft, missiles, and space vehicles. Can hydraulics do the job? W. Bobier, chief engineer, Aero Section of Vickers, said emphatically that Hi-temp hydraulics has come of age. A year ago discussion was centered on 400 F components; today it is obvious that the range in the near future will rise to 700 and 1200 F. Vickers is convinced that practical fluids for 1000 F hydraulics are feasible; and finds extremely promising results with 1000 F components.

After describing the important advantages of VTOL and STOL aircraft both for military and civilian use, Richard Williams of Vickers touched on some of the secondary power systems, employing hydraulic power, being considered in their design. These include the APU self-sufficiency package as well as a ground-power option. The author believes that the solution of each application will come as a natural result of the cooperation of every one concerned.

Although the principle of the vane type pump has been known for many years, recent developments at Vickers, described by R. P. Lambeck, have extended the range of utility of this type of pump to higher pressure and speed ranges; and have improved efficiency to the point where it is now suitable for a wide variety of aircraft and missile applications. One of its major applications is in fuel systems where the main fuel pump must handle a mess of contaminants. The author described both miniature and sub-miniature configurations.

With the increasingly severe demands on hydraulic systems for high performance flight vehicles and space craft, the problem of seals has become of overwhelming importance. Pressures are pushing beyond 4000-psi and temperatures have risen to 1200 F. To anticipate the problems generated by such increasing requirements, Republic Aviation Corp., has initiated a program of static and dynamic testing of seals. The method of attack and some of the results stemming from it were described by S. Cannizzaro of Republic. ■

# Electronic Control Cuts Inventory

(*Continued on page* 53)

The amounts taken from the finished parts to produce these finished products are marked on the shortage cards. They are sent back to the computer section, punched and read into the disk storage record. This, of course, can create a shortage of finished parts, and the cycle is repeated.

After items are shipped, the cards from which the original shipping papers were produced are fed through the machine to update the sales distribution and customer distribution records in it. These cards then go through the Accounting Machine to print our invoices.

To produce the complete biweekly inventory report previously mentioned, we simply feed master instruction cards into the RAMAC 305 and it "dumps" its entire inventory file onto cards, which we list through the Accounting Machine. ■



Circle 125 on Inquiry Card for more data ——→

# ROEBLING WIRE, in Convenient Bulk, packaged to save you money, time and labor

If you use high-carbon wire in sizes from .060" diam. to .030" diam., it will pay you to investigate Roebling's Reel-less Core Packaging System. This method offers you substantial savings in several ways—to say nothing of the quality wire that Roebling always delivers in any kind of package.

*Here's how simple it is:*
Cores are palletized two cores per pallet and can be stacked two or three pallets high (think of the saving in storage space).

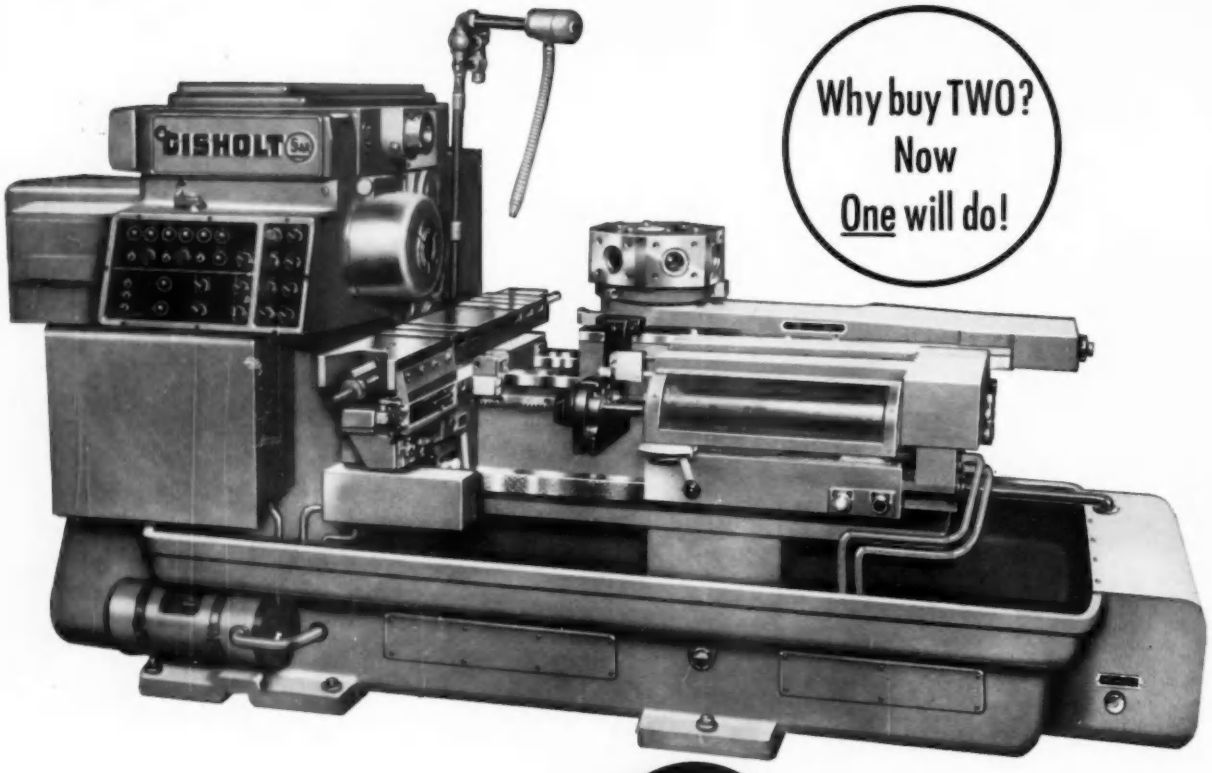
Empty reels are not accumulated because there are no reels to store, send back, bookkeep, get credit on, or pay shipping charges on (either way). Just unwrap the wire, set it up the way you see here, and there you are. Where a limited number of reel-less core packages are used, or where wire is flipped from reels mounted in a horizontal position, the tilt table is not necessary.

This method is typical, indeed, of Roebling's efforts to make quality easier to handle and to banish the problems that cost you time, money and sharp pains across the brow.

Full details of wire without reels will be immediately forthcoming when you write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

**ROEBLING**

*Branch Offices in Principal Cities*
*John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation*




# the GISHOLT AR (AUTOMATIC RAM) TURRET LATHE

## does both bar and chucking work

Why settle for less? The NEW Gisholt AR® (Automatic Ram) brings automatic cycle efficiency to both bar and chucking work—gives you low-cost automatic production at fixed rates on both small lots and long runs.

### Here are some of the advantages this new AR gives you:

1. Converts in 1 hour from chucking to bar work.

2. Sets up as fast as any ram-type turret lathe—much faster than any other automatic.

3. Saves time with infinite feeds, 16 speeds, plus a 25 h.p. motor to take full advantage of carbides.

4. Machines more surfaces per chucking with: a hexagon turret and two cross-slide stations—up to a 15″ chuck—a 14″ turret stroke and 10″ cross-slide travel.

With this new automatic, even a new man can get consistent quality at fixed production rates. He simply chucks, starts the cycle and removes the finished part. On bar work he does even less.

Ask your Gisholt Representative for a desk-side demonstration showing how easy it is to set up and operate the AR. Ask him to explain the cost-cutting features that add up to increased profits on your work. Or, write for Catalog 1224.

Investigate Gisholt's Extended Payment and Leasing Plans

GISHOLT®
MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers® • Threading Lathes • Factory-Rebuilt Machines with New-Machine Guarantee



Circle 126 on Inquiry Card for more data

Circle 127 on Inquiry Card for more data →

# MIDLAND

## Research and Development at Work

Trial by fire! New Midland materials are safety tested at fantastic temperatures . . . tortured at blast furnace intensity far beyond safety requirements to produce the world's safest brake systems.

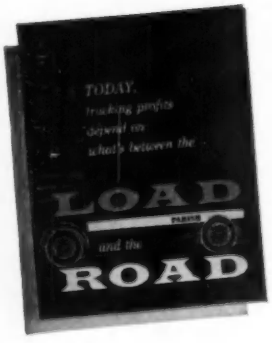
MIDLAND-ROSS CORPORATION

OWOSSO DIVISION OWOSSO, MICHIGAN

ONE OF THE "400" LARGEST AMERICAN CORPORATIONS

AIR BRAKES • AIR COMPRESSORS • AIR CONTROLS • VACUUM POWER BRAKES • DIE CASTINGS • CONSOLIDATED TRANSPORTATION EQUIPMENT

# The One BIG FACTOR That Increases A Truck's Life!




For the complete story on Parish heat-treated alloy siderails, write for the interesting, illustrated booklet—"Load and the Road."

Commercial vehicles — from off-the-road loggers to transcontinental vans —are being designed to carry heavier loads farther at a faster pace. And the BIG FACTOR that means longer life for many of these vehicles is extra-strength Parish siderails.

Parish alloy steel siderails are *277% stronger* than ordinary carbon steel. Made of heat-treated chrome manganese molybdenum steel, they're the finest combination of modern materials and design know-how. They mean extra strength without extra weight.

Parish siderails absorb shock better, hold their shape better, than do conventional siderails. Misalignments caused by frame warping are almost non-existent. Drive train components last longer. Maintenance costs and downtime are reduced.

That's why some 30 leading truck and trailer manufacturers are now designing their vehicles around Parish heat-treated siderails—the *extra strength* siderails that stay aligned.

**PARISH**
**PRESSED STEEL**
DIVISION OF DANA CORPORATION • READING, PENNSYLVANIA



Circle 128 on Inquiry Card for more data

**SILICONE NEWS from Dow Corning**

# Longer Life for Engines

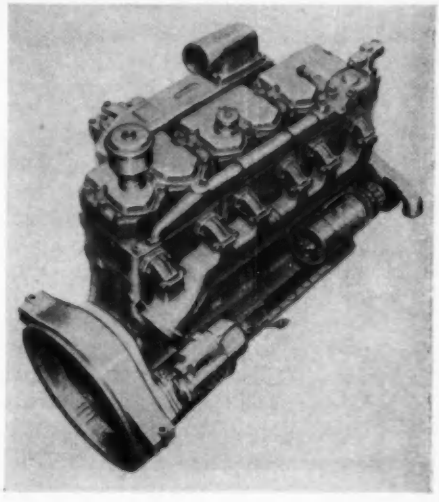
Oil seals, diaphragms, and many other automotive parts are fabricated of long-lasting Silastic, too. Original physical properties are essentially retained in temperatures from —130 to 500 F; resist oxidation, weathering, moisture and compression set. Silastic stays rubbery under the most adverse operating conditions — provides a combination of properties that permit components of this "talented" material to meet rigid performance requirements.

Your rubber fabricator can design parts to build longer life and customer-pleasing performance into your automotive products. For full information, write Dept. 0912.

## Grommets of Silastic Withstand 350F; Effectively Seal Coolants

To keep today's high powered construction equipment and on-highway trucks operating efficiently requires engines that are really rugged! And ruggedness is what Cummins Engine Company has built into their line of diesel engines. These engines are *guaranteed for 100,000 miles or 3,600 hours!*

A factor in the performance of their engines is a set of 24 cylinder-head grommets made of Silastic®, the Dow Corning silicone rubber. The grommets proved so effective in Cummins' new engines, they are now specified as standard components on other models throughout the Cummins line. These resilient silicone rubber rings are positioned over the entrances to coolant passages in the top of the block. They prevent leakage of coolant and antifreeze into the engine and the costly damage that could result. The grommets snap into the cylinder head gasket where they remain flexible and sure-sealing, despite attack by cooling fluids and engine temperatures in the 300 to 350 F range.



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first in silicones

**Dow Corning CORPORATION**
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



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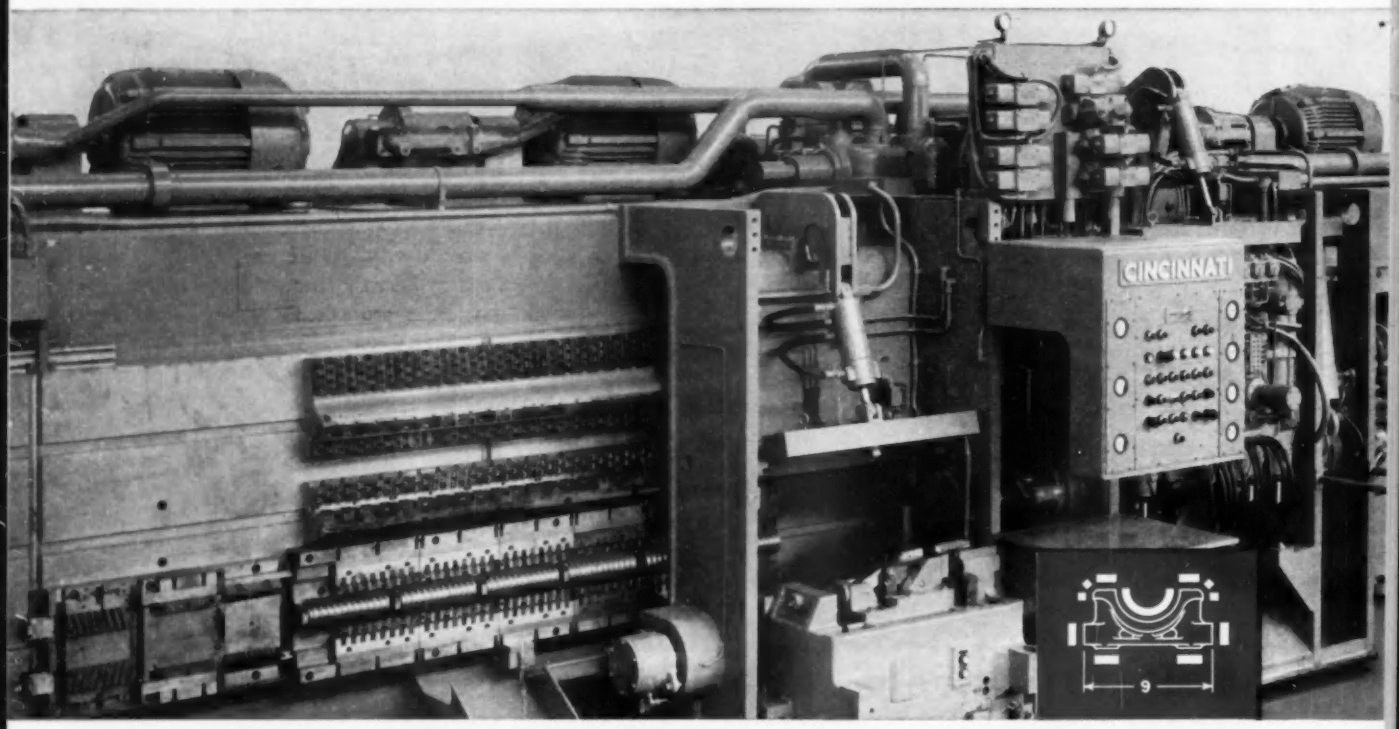
CINCINNATI

# CINCINNATI Surface Broaching Specialists consider everything . . . Including

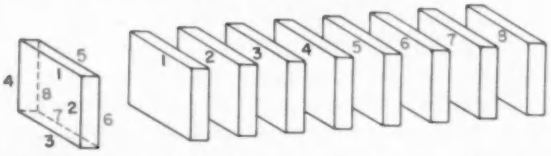
## *Throw-away Tool Bits*




Thirteen sizes of main bearing caps are surface broached on this CINCINNATI Horizontal Hydro-Broach Machine. Throw-away tool bits are indexed every 24,000 to 29,000 parts, and eight cutting edges are used, keeping costs at a minimum. Production, 80 parts per 48 minute hour. Catalog M-1910.

How will broaching stack up against milling or other machining methods? Cincinnati Milling's Engineering Service Specialists can give you the answer. How will *throw-away tool bits* stack up against those requiring resharpening? These Specialists can answer that too, because they consider every facet of machining cost. Throw-away tool bits for broaching*, a new idea offering substantial cost reduction, was one of the considerations in tooling up the Horizontal Hydro-Broach Machine illustrated above.

Through an ingenious tool holder arrangement, developed by Cincinnati Milling's Special Machine Division, throw-aways are used eight times before discarding. Let's assume that we have sintered carbide bits. Using only one cutting edge, 20,000 or more parts can be broached. The bits are unclamped, turned 90° and the second edge is available to broach another 20,000 parts, and so on. Both sides of the bit are used (negative rake angle). Then there are eight cutting edges, as indicated in the drawing below.




The throw-away idea is a typical example of the advanced thinking and modern approach to low-cost production which Cincinnati's Special Machine Division imparts to broaching machines, production lines and every type of equipment built to your requirements. May we send you more information? **Special Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

*Patent pending.

Circle 130 on Inquiry Card for more data

SPECIAL MACHINES • VERTICAL AND HORIZONTAL BROACHING MACHINES • COMPLETELY AUTOMATED PRODUCTION LINES

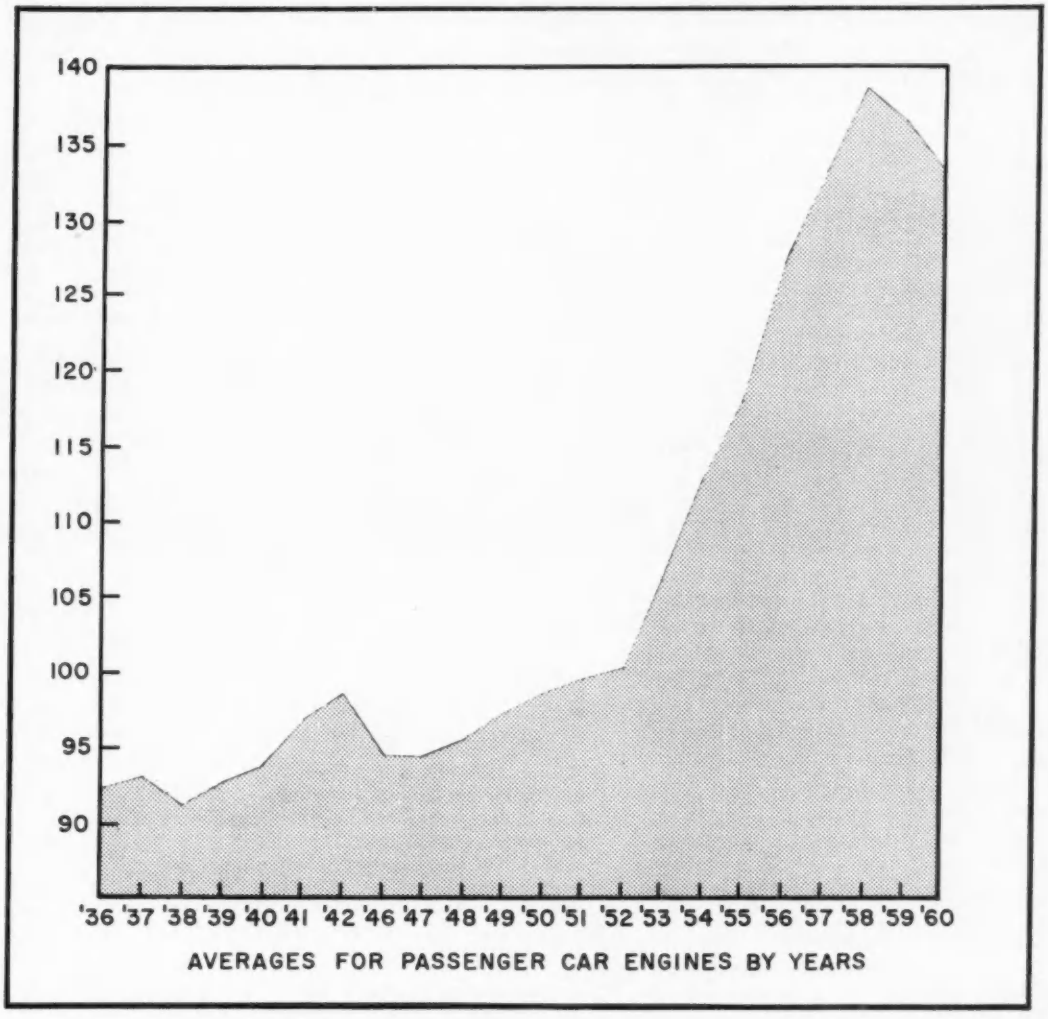
CINCINNATI®
SPECIAL MACHINE DIVISION

TEAR OUT ON THIS LINE

# A.I. AUTO-TECHNICS DATA SHEETS

## Basic Automotive Design and Production Technical Data For Permanent Reference

### AVERAGE B.M.E.P. AT MAXIMUM HORSEPOWER, 1936-1960




Average B.M.E.P at Max. Hp. (lb. per sq. in.)

| | | | |
|---|---|---|---|
| 1936 | 92.3 | 1950 | 98.6 |
| 1937 | 93.1 | 1951 | 99.5 |
| 1938 | 91.2 | 1952 | 101.4 |
| 1939 | 92.7 | 1953 | 106.0 |
| 1940 | 93.9 | 1954 | 113.1 |
| 1941 | 96.7 | 1955 | 118.1 |
| 1942 | 98.5 | 1956 | 127.2 |
| 1946 | 94.6 | 1957 | 133.4 |
| 1947 | 94.5 | 1958 | 138.8 |
| 1948 | 95.3 | 1959 | 136.3 |
| 1949 | 97.3 | 1960 | 133.3 |

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# ASBE 15th Annual Convention

(*Continued from page* 49)

He also indicated that aluminum extruded bumpers can be finished in one of a number of different ways:

**by anodizing**

**by clear surface coatings over a buffed surface or over a buffed and anodized surface**

**by plating with copper-nickel-chromium, or nickel-chromium**

## Noise Reduction

Silencing of the complete car, reducing noise, and isolating the passengers from noise-producing running gear components is one of the major objectives of all vehicle producers. J. R. Farnham, Chrysler Corp., covered this highly technical subject in a paper entitled "Silencing the Automobile." He touched in some detail on the nature of sound, described the traditional approaches to analysis and correction of noise.

Farnham then concluded that the conventional approaches to sound reduction are not very efficient. A veritable revolution in scientific techniques and equipment has opened entirely new possibilities at Chrysler. For one thing, Chrysler recently invested over $500,000 in a so-called electronic highway. It is a highly specialized, nine-room laboratory that forms a nerve center for sound and vibration testing and development, making it feasible to trouble-shoot sounds and vibration in prototype models of future cars.

Supplementing these facilities, Chrysler has developed a Hi-Fi technique to drive the air column in the passenger compartment; this, in turn, driving the various body panels. The entire audible frequency range is covered while holding energy input constant. Each individual panel then is probed with a vibration pick-up to determine its resonant characteristics.

Chrysler also is employing computers for analyzing the vibration characteristics of the entire drive train. By means of a mathematical model subjected to electronic computer analysis, it is possible to predict the behavior of a specific drive train while still in the drawing board stage.

The missing link in present day procedures is in a better understanding of the phenomena of passenger compartment resonances and associated panel resonances. The final answer lies in some way of translating the entire body structure into a mathematical form which can then be analyzed by means of the computer.

## Plastic Model Procedures

Discussion of the Artco system of plastic model procedures by Haley and Vertin of Artco Plastics, Inc., was centered on the patented "perimeter system" developed by this company over the past six years. At the present time the company has three patented methods available to industry.

**1—Use of shaped perimeter which corresponds in plan and elevation to the body draft or two-plane engineering information.**

**2—Similar to Method 1, except that it can incorporate new or additional information. This is suitable for the situation where interchangeable series of car lines can utilize the same perimeter to expedite the program.**

**3—Adjustable perimeter method, incorporating a perimeter taken from a female plaster off styling clay. The perimeter is loose and adjustable on the model supporting structure so it may be balanced or made symmetrical.**

A thought-provoking paper presented at this meeting was one dealing with the utilization of the newer high tensile steels as the key to lighter weight combined with greater strength to produce a more efficient structure. It was presented by Max W. Lightner, vice-pres., United States Steel Corp. ■

# BOOKS . . .

COST REDUCTION AND PROFIT IMPROVEMENT, *published by Machinery & Allied Products Institute, 1200 Eighteenth St., N. W., Washington 6, D. C. Price, single copy $1.50; ranging downward to $.75 each for quantities 150 and over.* The Institute's latest pamphlet, comprising 67 pages, contains the informal observations of 14 capital goods' executives on cost reduction and profit improvement in the fields of manufacturing, marketing, purchasing, and finance.

FUEL CELLS: POWER FOR THE FUTURE, *by nine graduate students at the Harvard Business School, published by Fuel Cell Research Associates, P. O. Box 157, Cambridge 38, Mass. Price, $18.75.* Presented in a 160-page illustrated report is a technical and economic analysis of the developments and potentials of electro-chemical fuel cells.

# Machining Operations on 1961 Oldsmobile Components

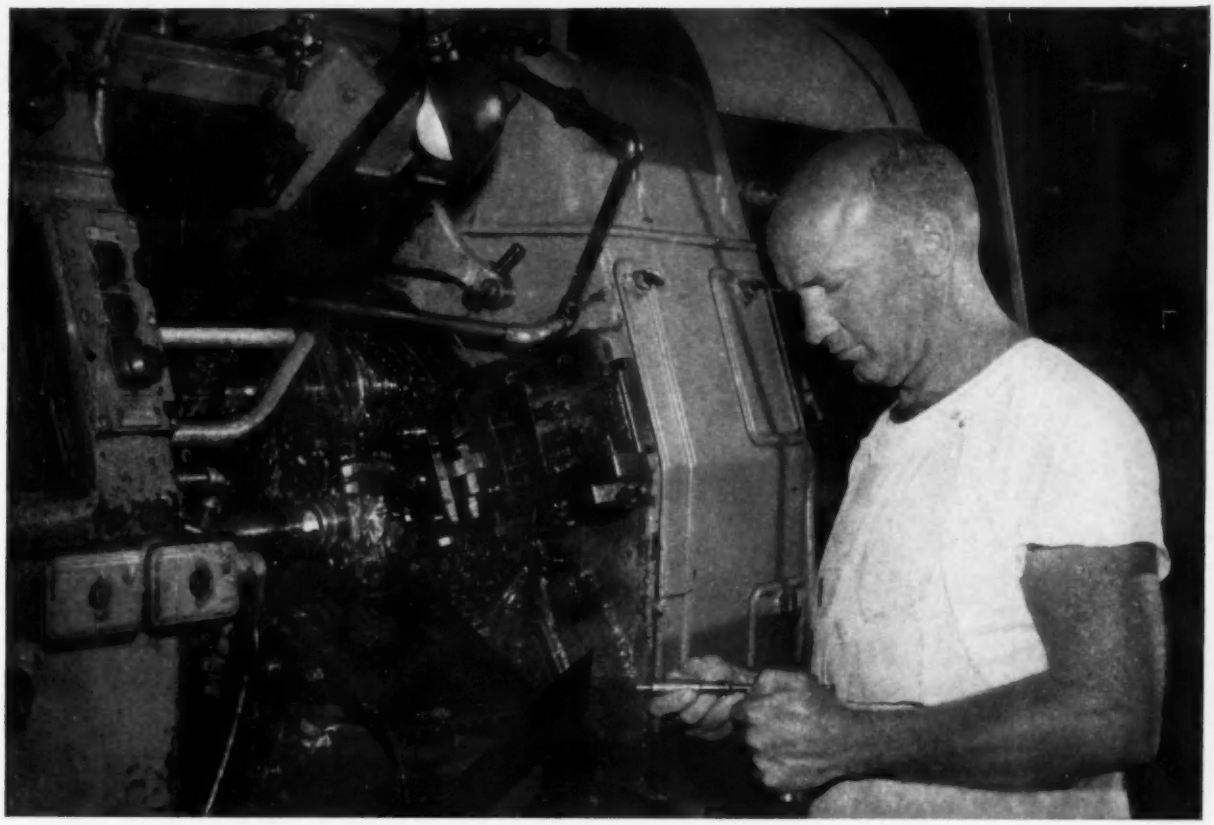
(*Continued from page* 35)

The machine is shown in perspective in the photograph. It may be noted too that each of the massive pallets holds a right and a left hand knuckle. The complete sequence of operations consists of the following: drill, taper ream, mill, deburr, tap.

Operations in detail are as follows:

| Station | Head | Operation |
|---|---|---|
| 3 | A&B | Drill two holes (each) |
| 4 | C&D | Drill two holes (each) |
| 5 | E&F | Rough taper ream two holes (each) |
| 6 | G&H | Deburr two holes |
| 7 | J&K | Finish taper ream two holes (each) |
| 8 | M | Drill two holes |
| | L | Mill two bosses |
| 9 | Rotate Part | |
| 10 | N | Drill & chamfer two holes; probe two holes |
| 11 | P | Drill & chamfer four holes; drill two |
| 12 | R | Drill two holes |
| 13 | S | Drill two cotter pin holes |
| | T | Chamfer four holes; probe and flush two holes |
| 14 | U | Combination ream two places<br>Ream four holes |
| 15 | V | Two threads; tap two holes |
| 16 | W | Mill two keyways |
| 17 | X | Deburr keyway |

Altogether the Natco transfer machine has 55 spindles in active operation. It may be of interest to note that the steering knuckle is a drop forging made from SAE 1345 steel with Brinell hardness ranging from 255 to 293. ■



# Manufacturer increases tool life 20% with CLEARTEX

## —saves $100 monthly on oil alone!

The Master Vibrator Company of Dayton, Ohio—maker of portable heaters, cement finishers and other contractor equipment—was having trouble with lube oil diluting the cutting oil on their automatic screw machines. There were too many tool regrinds and too many rejects. A Texaco Metalworking Engineer suggested a test of Cleartex. They agreed to using a 10 gallon sample on one automatic. That was November, 1959.

In one month they were convinced. By using Cleartex on both cutting and lube sides they solved their problem —no more dilution of cutting oil. And look at the results: Tool life increased 20%; actual monthly savings on oil of $100; less carry-off on chips; cleaner machines; fewer rejects; happier operators and delighted management! No wonder they switched entirely to Cleartex and are now regular users of 10 drums a month!

Why not send for your copy of Texaco's new booklet —"Cleartex in Automatic Screw Machines." This illustrated guide will show you how to end dilution of cutting oil—and the profit-draining costs in rejects and tool life it causes. Just mail the coupon. Or if you want immediate savings, ask to have a Texaco Metalworking Engineer set up a test in your plant—on one machine, or on your whole line.

Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

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# NEW PRODUCTION and PLANT EQUIPMENT

By C. J. Kelly
ASSISTANT EDITOR

*FOR ADDITIONAL INFORMATION, please use reply card at back of issue*

## Sensing Device

DAMAGE resulting from oversize workpieces in automatic, as well as standard, machine tools can be prevented by a sensing device developed by *Michigan Tool*. Applied first to the Detroit company's new model 870-A Mark II gear shaving machine as a 'cutter protector' but also applicable to *Michigan Tool* machines in the field, the attachment permits setting one pointer on a meter to the maximum load allowed by the setup. A second pointer on the meter indicates the actual load resulting from stock on the blank.

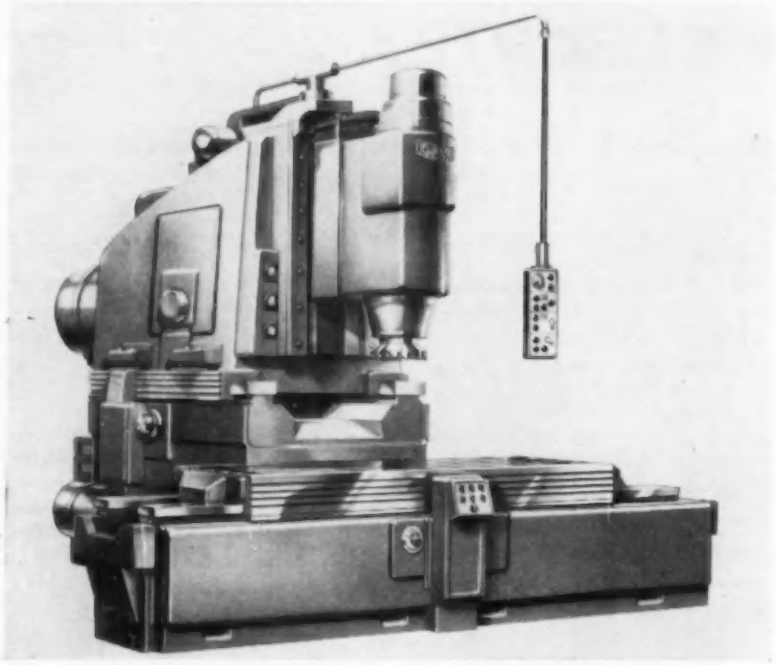
If the load equals or is greater than the preset limit, the device automatically interrupts the machining cycle. It can do this by retracting the tool from the work, stopping the machine cycle, etc. In any case, the device also signals that something is wrong.

The sensing mechanism operates by continuously checking the armature current being drawn by the cutter-drive motor. This technique is sufficiently sensitive to register stock variations in thousandths.

By occasionally glancing at the meter, the operator can anticipate and prevent trouble. When a series of gears tends toward the high side, he can notify the previous department that their cutting operation is about to go out of control. *Michigan Tool Co.*

**Circle 38 on postcard for more data**

## Vertical Head Bed Type Milling Machine



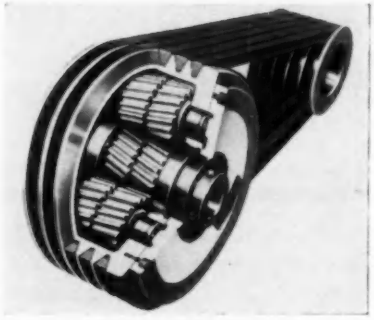
*The Mil-waukee-Mil Model 3006 milling machine incorporates numerous features for precision production operations. The table has a working surface of 94 by 30 in. and a 72 in. feed range. The spindle speeds are from 15 to 1500 rpm. An electronic feed back system maintains constant selected feed rates regardless of load or electrical conditions. An optical measuring system is available with this unit as an optional feature. Kearney & Trecker Corp.*

**Circle 39 on postcard for more data**

## Rotating Transmission

A SHAFT mounted rotating transmission is reported to provide a combination of control flexibility, high torque capacity and compact size. Known as the Roto-mission, this unit affords reduction ratios of up to 270 to 1, exclusive of additional reduction through pulley drive from the drive motor, and affords a wide range of control options for many uses.

The flexibility of control is exhibited by three basic methods of control. Actuation—Driving can be engaged or disengaged through mechanical, hydraulic, pneumatic or electrical means. Overload — Load limiting or releasing, and overload alarm can be provided by various systems of auxiliary devices. Speed—Dual speed operations can be provided by various means of clutching.



The units are available in capacities from fractional through 60 hp, for torque ratings through 21,850 lb-ft in standard models. Special units can be supplied for extremely high torque capacities.

Two-speed operation can be obtained with Roto-mission transmissions through two basic methods. The simplest scheme consists of using manual or electric clutches which can provide an output of either the normal reduction speed or direct drive without any reduction. Another method consists of using an auxiliary motor with clutch control to permit selection, for instance, of the main motor for high-power high-speed drive, or a small motor for low-speed low-power drive. *Industrial Div., Airborne Accessories Corp.*

**Circle 40 on postcard for more data**

## Compact Degreaser

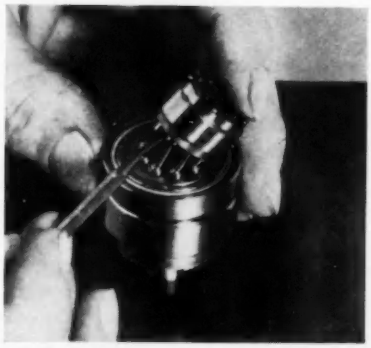
THE Vibra-Bantam, a new, small, subsonic degreaser features high production automatic in-line cleaning for all small parts, without manpower. The vibra principle utilizes a vibrating spiral elevator to move the work rapidly through non-flammable cleaning solvents and vapors.

This compact unit, 20 in. sq with a 42 in. overall height, will process the full capacity of any screw machine, cold header or punch press, the manufacturer reports. Chips are automatically separated and clean dry parts continuously emerge ready for inspection. It is available with either steam or electric heat. *Manpro Corp.*

**Circle 45 on postcard for more data**

## Hydraulic Pump

THE highest speed ever run by any known piece of reciprocating machinery! This claim is cited for the model 905 piston type hydraulic pump,



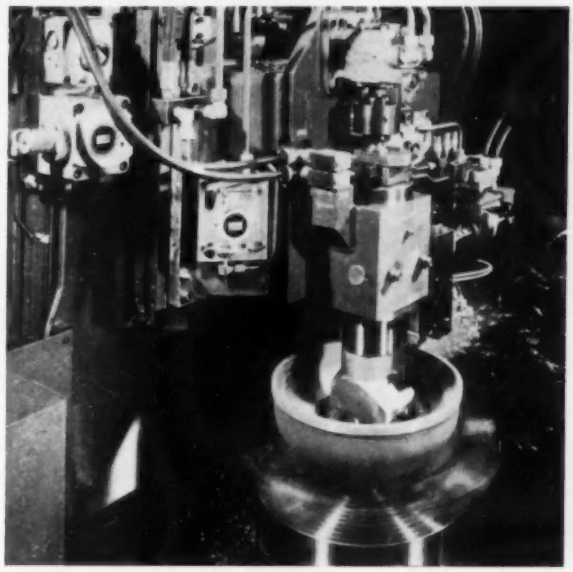
which operates at a speed of 40,000 rpm. The rotating group of the 905 weighs 6.7 oz, and it is so small that it fits inside the piston bore of larger units manufactured by Vickers.

Measuring 2.5 in. dia by 2.7 in. long, the pump delivers 13.1 hp at 40,000 rpm. *Vickers Inc.*

**Circle 46 on postcard for more data**

## Vertical Turning Unit Composed of Low-Cost Components

*The model 1-V vertical turner has been assembled of components produced in lots to hold down costs. This machine tool is designed to make a mass chip-removal attach on the object being turned. On the motor end-bell shown, a number of machining operations are occurring simultaneously. Several different diameters are being rough-bored and turned and then finish-bored and turned. The vertical turner speeds through the task in just 46 seconds.*



TO start the operation, the operator places the end-bell into position and presses a button, activating the chuck. Pressing another button, the vertical turner goes through a complete machining cycle without further manual control. Rough and finish boring the turning are accomplished in one hydraulically controlled movement. This is controlled through a vastly simplified programming system, which a production man can change to suit altered production requirements. *Motch and Merryweather Machinery Co.*

**Circle 44 on postcard for more data**

## Gravity Conveyors

A NEW line of aluminum and galvanized steel frame roller type gravity conveyors has been designed.

Maximum load capacities range up to 1000 lbs for the five ft steel frame sections and up to 800 lbs for the same size aluminum frame sections. Weight of the aluminum track is

roughly one half that of the steel.

Track sections are available in five and 10 ft lengths and in 12, 18, and 24 in. widths. Curved sections are supplied to match.

Rollers are furnished in five different spacings ranging from three to 12 in. apart. Rollers have free floating ball bearings and steel rod axles with self-locking nuts.

Castored portable supports, aluminum gates, package stops and other accessories are supplied to fit varying needs. *Hytrol Conveyor Co.*

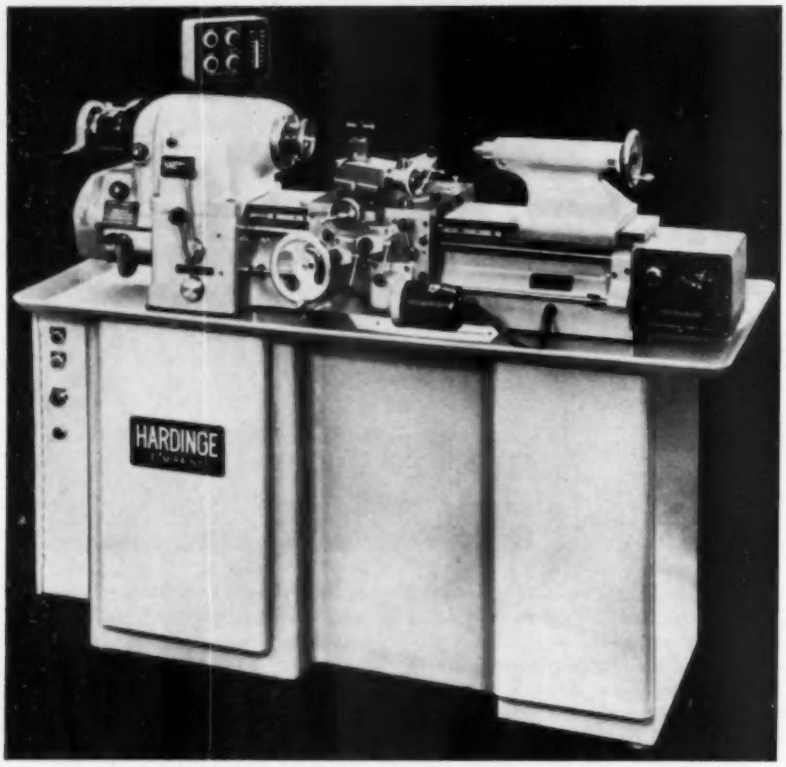
**Circle 47 on postcard for more data**

## Push Type Welding Gun

A NEW air-cooled push type welding gun and wire feeder for use with the gas-shielded metal-arc welding process is now available. The gun, model AH60-B, has a 60 deg gooseneck nozzle assembly for welding in hard-to-reach places, and a lever type trigger for ease of operation. It can be used with buried arc welding and sprayarc welding using carbon dioxide as a shielding gas, or standard gas-shielded metal-arc welding — Aircomatic—using argon as a shielding gas. The wire feeder, designed for use with this new welding gun, includes a remote speed control with 15 ft of service cord to provide wire feed speed adjustment, up to 600 ipm, near the work. *Air Reduction Sales Co.*

**Circle 48 on postcard for more data**

## Precision Lathe Features Variable Speed Drive




*Automatic thread length control and quick-acting compound slide for threading are standard equipment on new lathe.*

THIS new lathe, known as the HLV-H, combines many new features and is designed to fill the gap between the plain precision bench lathe and the heavy duty engine lathe. This unit has an 11 in. swing over the bed, and infinitely variable speeds of 125 to 3000 rpm by means of a push button controlled electrical actuated variable speed drive. The larger headstock frame and large super-precision preloaded ball bearings provide maximum precision for sustained operation at full speed. The headstock spindle has a through collet capacity of 1-1/16 in., and step chuck capacity of 6 in. The spindle lock pin is electrically interlocked to prevent starting main drive motor when pin is engaged. The headstock drive belt can be changed without removing or disturbing the high precision bearing or spindle. The bedways are of the wide dovetailed design, hardened and precision ground steel. The carriage and apron are of one-piece construction for sustained accuracy and rigidity. The carriage has a full bearing on the top of the flat bed for maximum support of cross slide and carriage ways. *Hardinge Brothers, Inc.*

**Circle 41 on postcard for more data**

## Foil, Sheet Metal Test

THIS new type of ductility testing machine has been designed for foil and thin sheet metal test operations. Called thin sheet metal and foil tester, model TSD, the unit is designed to permit quick, accurate readings for

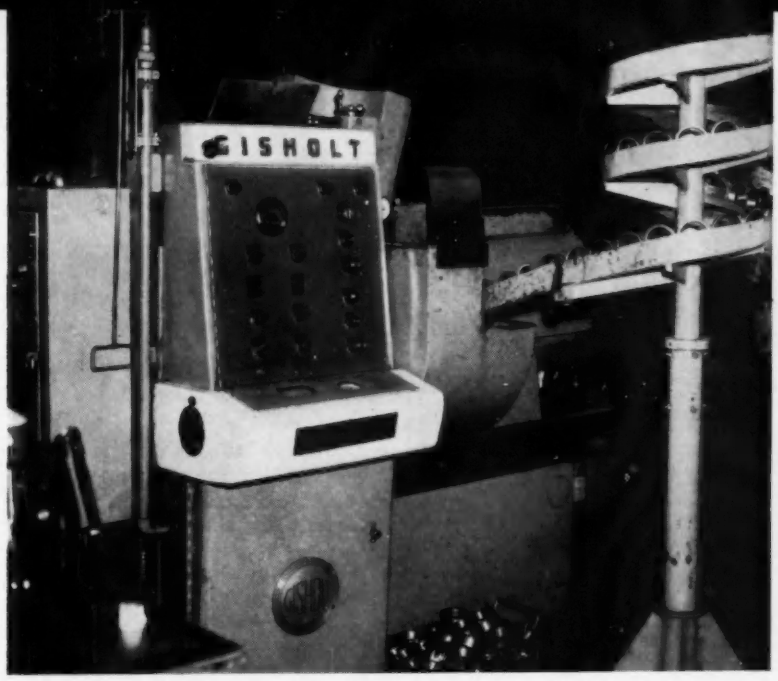
both experimental and production work. Gripping pressure and movement of test piston of the machine may be adjusted to different levels independently of each other, so as to fit whatever test conditions are desired. Tests are carried out in full view of operator. The new testing machine is available in five gauge calibrations, ranging from 200 lbs to 2000 lbs, for work ranging from 0.002 to 0.020 in. maximum thickness. *Detroit Testing Machine Co.*

**Circle 43 on postcard for more data**

## Layout Drilling Machine With Numerical Control

*A layout drilling machine with numerical control having both tape and dial input, was designed to provide a large degree of flexibility in setting up a wide variety of operations. Special attention has been given to the speed with which set-ups can be made and the versatility that is needed for the type of work for which this machine was designed. The stops for the depth of rapid traverse and the depth of feed are all directly located in front of the operator at approximately eye level, with all nine pairs of stops readily accessible and in view of the set-up operation. Edlund Machinery Co.*

**Circle 42 on postcard for more data**



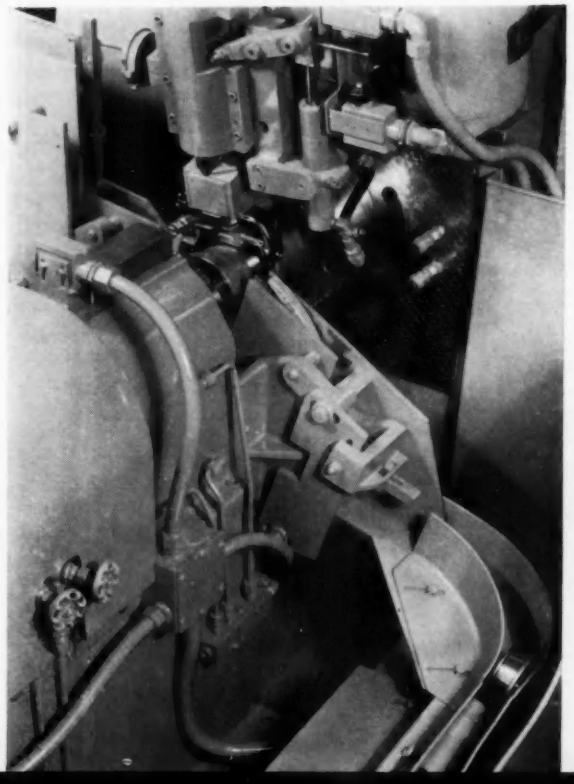

*Masterline 79A Bearing Race Superfinisher at International Harvester Co. Dial controls at left govern basic machine functions. The gravity loader at right feeds unfinished tapered roller bearing cones into machine for a fully-automatic work cycle.*

# Superfinishing Bearing Raceways at IHC

By
**Charles A. Weinert**
EASTERN EDITOR

SUBSTANTIAL cost savings have been achieved with the application of a new machine at International Harvester Company's West Pullman, Works, Chicago. Equipped with automatic work-handling devices, the Gisholt Model 79A Bearing Race Superfinisher is finishing raceways of 2⅝-in. bore tapered roller bearing cones in a "floor-to-floor" time of only 10 seconds. Prior methods took almost a full minute.

*View from rear of machine showing superfinishing stone engaging workpiece, and a superfinished part in discharge conveyor.*



The bearing raceway has a taper of 12 deg. In operation, ground parts are placed in a gravity loader at the front of the machine. A pocket wheel indexes the work to chucking position. The tailstock then moves the part over an arbor with an expanding sleeve, holding it against positive stops as it is chucked in the ID. Work then proceeds with the superfinishing stone engaging the outer track surface.

At the end of the automatically-controlled work cycle, the stone and tailstock retract and spring-loaded pins—previously compressed by the tailstock —eject the part.

The pocket wheel thereupon indexes a new workpiece into position, while at the same time discharging the finished part on a gravity conveyor at the rear of the machine.

Former methods required a second grinding pass, consuming 25 seconds, which brought the surface finish from 60 to 25 microinches. Then the raceways were finished to 8 microinches, taking an additional 30 seconds. With the present setup, the raceways are superfinished from 60 to a "controlled" 8 microinches in a total of 10 seconds per piece.

The Gisholt machine at International Harvester can handle bearing cones ranging in OD from 2½ to 4¾ in. Different part sizes necessitate adjustment of loader tracks, replacement of the pocket wheel, arbor sleeve, and superfinishing stone. The quill is adjusted for angle and diameter. Separate sets of dial controls on the machine can be adjusted for spindle speed, stone pressure, reciprocation rate, and stone contact time. ■

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DISCERNING DRAFTSMEN THE WORLD OVER DEMAND IMPERIAL THE WORLD'S FINEST TRACING CLOTH

## ON OUR WASHINGTON WIRE

**Efforts by labor leaders such as David J. McDonald, president of the United Steelworkers, to win a 32-hour work week will not get the backing of President-elect John F. Kennedy. He does not believe shortening the workers' hours is a solution to the unemployment problem. McDonald wants Congress to establish the shorter work week to provide jobs for more men. He says there are 150,000 steel union members unemployed and more than 300,000 working a reduced work week.**

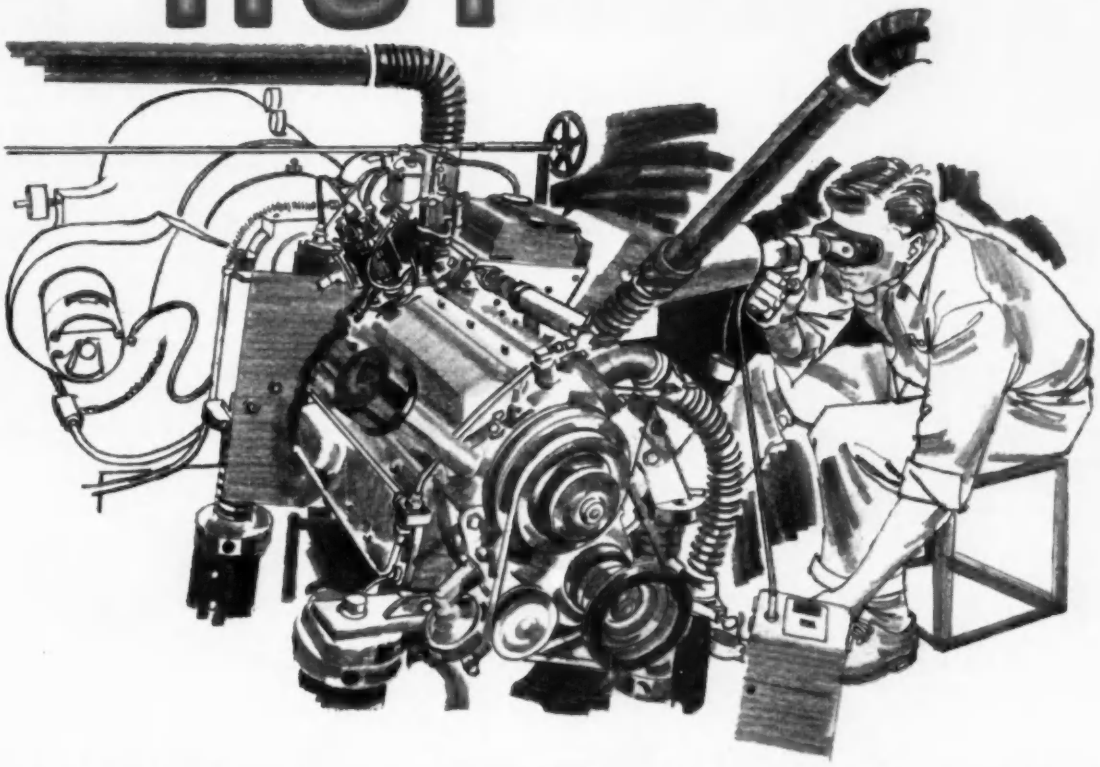
Growing income from vehicle license fees continues to make up a substantial part of state revenues. License and title fees rose 5.4 per cent to $1.4 billion this year. This is about $70 million above 1959 and more than double what they produced in 1950. The Census Bureau says the fees represent more than eight per cent of all state income.

**Labor Department officials are predicting that unemployment will increase substantially next year. They say the 1.3 to 1.5 million youths who will be leaving school and looking for work in 1961 will cause "considerable difficulty" in the job market at least until the middle of the year.**

The Army is trying to work the Nike-Zeus anti-missile missile into a big spot in the budget of President-elect Kennedy. Army spokesmen are talking up the Nike-Zeus in the Pentagon and out. They claim it is ready for production. The next President looks favorably on missile projects.

**The new President is expected to throw administrative and legislative props under the steel industry as soon as he takes office. He has continually expressed dismay at the slack operating rate in basic steel. He will try to stimulate steel production in the hope it will lift the sagging economy.**

# How HOT are Your Valves?



## Eaton Technique Determines Valve Operating Temperatures—Permits Accurate Selection of Valve Materials

**1.** The valve to be studied is duplicated in a special steel which has a known temperature response in terms of hardness.

**2.** The temperature-responsive valve is run for a brief period in a test engine, under the operating conditions which are of interest to the engine builder or user.

**3.** After removal from the engine, the valve is sectioned in the metallurgical laboratory, and checked for hardness at all strategic points. From these hardness indications the corresponding temperatures at which the valve was running can be accurately computed.

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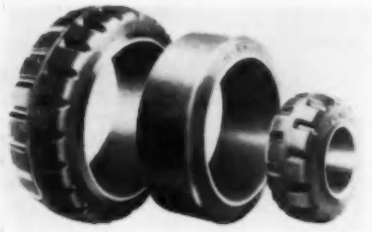
# NEW PRODUCTS AUTOMOTIVE-AVIATION

*FOR ADDITIONAL INFORMATION, please use reply card at back of issue*

By C. J. Kelly
ASSISTANT EDITOR

## Press-On Tires

A complete line of polyurethane press-on tires have been designed for industrial trucks and equipment. The line is the result of four years of test-



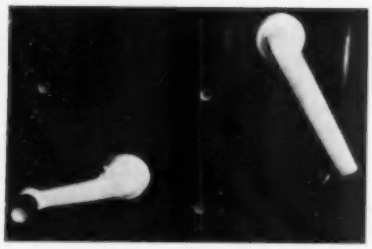
ing and development. Both smooth solid tread and cushion traction tread types are available in a wide range of sizes and widths. The manufacturer reports the tires will support loads up to 15,000 lb per wheel. *American Vulko-Tread Corp.*

**Circle 60 on postcard for more data**

## Truck Door Handles

"Delrin" acetal resin and "Zytel" nylon resin are teamed together in a new important application in the automotive field—the use of plastic materials to stylize a functional body area while adding greater utility. Featured on Ford Motor Company's Econoline trucks are inner door handles and window regulator handles made of "Delrin" with knobs in "Zytel."

In adapting to "Delrin" in the window regulator handles, design engineers took advantage of the resiliency



of nylon in molding the knobs with a four-pronged shaft that allows a simple snap fit assembly.

Advantages of these materials are their dielectric characteristics, eliminating static shock; thermal insulation qualities—they are warm to the touch in winter and cool in summer—and the low co-efficient of friction for both materials, important in smooth operation of the window regulator handle and knob. It's reported their use produces weight savings of more than 67 per cent and provides manufacturing advantages due to the injection molding process. *E. I. DuPont De Nemours & Co.*

**Circle 61 on postcard for more data**

## Special Duty Linings

Two new brake linings have been designed for special duty applications where an excessive amount of hard

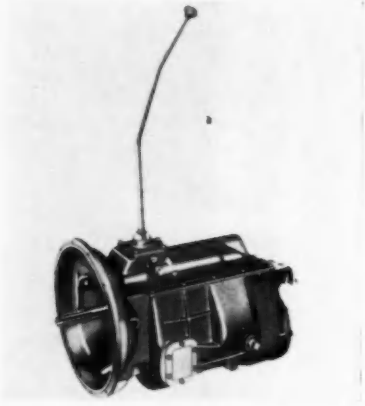
use is encountered. One known as "Interceptor" is specifically engineered for police car requirements and has been successfully tested by law enforcement agencies. Another potential market is the ambulance or any vehicle that makes fast stops at high speeds.

The other new lining, known as "Special Service" was developed and tested for vehicles in multi-stop service such as taxis, city delivery trucks, etc. Tests are claimed to show that Special Service outlasts ordinary friction materials by three to one on rural mail delivery vehicles. *American Brake Shoe Co.*

**Circle 62 on postcard for more data**

## Heavy Duty Transmission

The development of a new extra heavy duty five-speed Spicer truck transmission in the 8000 Series is said



to be the largest capacity unit with direct drive in fifth gear on the market today. It was designed primarily to complement big diesel engines.

With this new 8000 Series Spicer transmission, top vehicle speed is obtained in direct drive. Its ratios are spaced so they are functionally split or compounded with those of two and three speed axles and three and four speed auxiliary transmissions. Both 14 and 15½-in., two plate Spicer clutches are matched for top efficiency with the unit.

The new 8000 Series Spicer five-speed transmissions are available with either iron or aluminum cases. *Dana Corp.*

**Circle 63 on postcard for more data**

## Aircraft Tires

Jet planes landing at speeds up to 250 mph roll to smooth stops more safely with the help of wire cut to precisely-specified lengths as short as ¼-in. and molded into the aircraft tire treads. According to the manufacturer the fine wire also doubles life of jet aircraft tires.

Aircraft tires are safer from blow-outs because the cut wire dissipates much of the heat that would other-

wise build up on the tread surface at the high landing speeds of jet aircraft. The wire also protects the tread from cutting and small brakes that would occur as the tires hit small stones and sharp edges on the runway. Also the wire permits thinner treads. This minimizes danger of tread being thrown off the tire due to centrifugal force. The heavier the tread, the greater would be the ten-

dency of centrifugal force to throw the tread off a rapidly spinning tire.

Some ends of the wire are exposed at the tread surface, helping tires grip the runway, and reducing skidding.

Typical tires use brass-plated carbon steel wire about twice the thickness of human hair (0.0058 in. diameter) cut to precise lengths. *National-Standard* then de-magnetizes the wire to keep it from bunching together. The wire is mixed into the tread compound before the tire is molded and cured.

Finished tires may support up to 65,000 lbs deadweight each. They are inflated to 250 lbs or ten times the pressure usually used in passenger car tires. As many as 16 tires may be used per plane. *National-Standard Co.*

**Circle 64 on postcard for more data**

## Universal Joints

A basic engineering improvement incorporated in the 1961 Buick and Lincoln-Continental passenger cars involves the use in their power trains of double cardan constant velocity universal joints.

Spicer units being used in both cases are said to permit greater propeller shaft operating angles than are possible with single cardan joints, thus providing design groups with a variety of styling advantages leading to substantially greater flexibility in the complete car package.

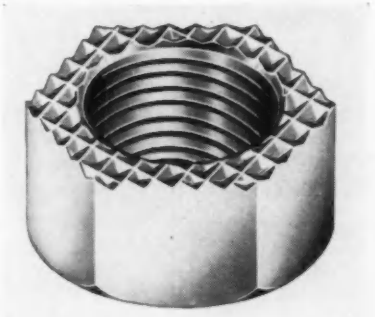
An operating advantage claimed for double cardan universal joints is a marked reduction in vibration and noise levels which results from the constant velocity output of the units. Hence their use not only enhances the eye-appeal of motor cars, but also improves their comfort and efficiency.

On the design side, by permitting greater shaft angularities, the double cardan joint, basically consisting of two single joints in tandem, permits such design liberties as tilting the engine, dropping the rear axle, reducing the height of the floor tunnel, etc., while at the same time relieving the squeeze that has been imposed upon the power train engineer by latter-day automotive styling trends. *Dana Corp.*

**Circle 65 on postcard for more data**

## Waffle Face Locknut

A new Waffle Face Locknut is produced by a cold headed process for greater strength and higher quality. It is available in all commercial sizes



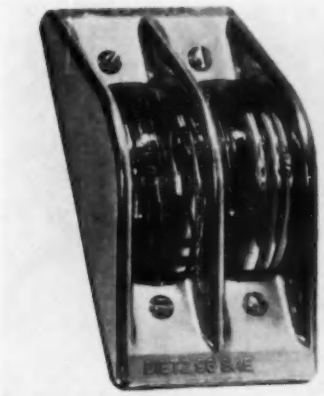
in steel, brass, aluminum and stainless steel in all finishes.

Due to completely automated production facilities, the new waffle face locknut will be an exceptionally high quality product, offered at extremely competitive prices. *Jacobson Nut Mfg. Corp.*

**Circle 66 on postcard for more data**

## Clearance Marker Light

The development of a new aluminum armored clearance marker light incorporates two 2-candlepower triple life bulbs which are rated at 1500



hours. The heavy duty cast aluminum body has a center bar for added bulb protection. If one bulb burns out the other will stay lit. A steel back plate on the Velvaglaze finished aluminum casting is corrosion resistant and designed for full flush mounting with four mounting screws. A special rubber compression grommet seals the pigtail wire and plate. *R. E. Dietz Co.*

**Circle 67 on postcard for more data**

## Pneumatic Tired Wheels

A wide range of small diameter pneumatic tired wheels have been designed for industrial and argicultural applications. The wheels are designed for low speed light duty operations in various hub and bearing combinations ranging in diameter from 5/8 in. upwards, to hub lengths up to 7½ in. using 8 in. pneumatic tires. The manufacturer reports plans to expand the line in the future to cover an even wider range of wheels for industrial and marine applications. For best ser-

vice possibilities the wheels are offered complete with tires and bearings for ready application. *Kelsey-Hayes Co.*

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# Machining Aluminum Cylinder Blocks

(*Continued from page* 38)

and Greenlee is made by means of Centri-Spray automation. Blocks come out of the Natco onto an elevator, then across a wide aisle on a conveyor that transfer them into the Greenlee machine.

The last machine on the initial operations on the block is an 11-station Lamb drilling and tapping transfer machine with the following sequence of operations:

| Station | | Operation |
|---|---|---|
| 2 | | Load. |
| 3 | RH Head | Tap-drill and chamfer 8 holes, tap-drill two dowel holes. |
| | LH Head | Tap-drill and chamfer 5 holes, drill 4 holes. |
| 4 | RH Head | Tap-drill and chamfer 8 holes, ream two holes. |
| | LH Head | Semi-finish-ream two holes. |
| 5 | | Probe all holes. |
| 6 | RH Head | Bore water pump opening and front cam bearing. |
| | LH Head | Rough-bore rear cam bearing. |
| 7 | RH Head | Rough-bore 1st inter. cam bearing. |
| | LH Head | Rough-bore 2nd inter. cam bearing. |
| 8 | | Idle. |
| 9 | RH Head | Tap 8 holes. |
| | LH Head | Tap 5 holes. |
| 10 | RH Head | Tap 5 holes. |
| | LH Head | Idle. |
| 11 | | 180-deg turnover. |

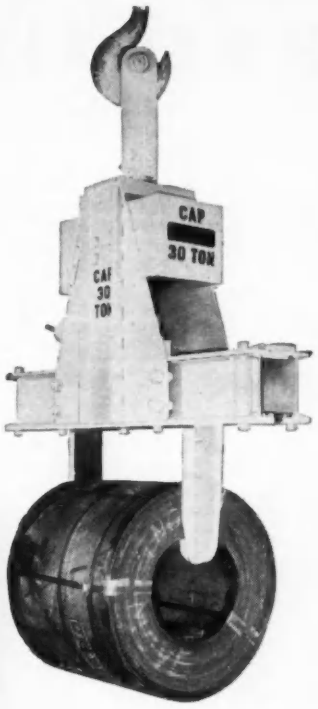
This marks the end of the initial machining operations. The main bearing caps now are assembled and driven home by means of a torque-controlled eight-spindle Ingersoll-Rand multiple nut runner and the block is ready to proceed as an assembly. The first operation at this stage is boring and chamfering in a 10-station Ingersoll transfer machine. It is set up to semi-finish-bore cam and crank bearings, turn oils seals and slinger grooves, semi-finish-bore distributor and oil pump bores, chamfer the top and bottom of cylinder bores in one setting. In addition, Stations 7 and 8 semi-finish and finish-bore six cylinder bores in alternate blocks.

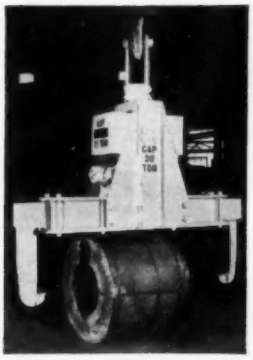
Cylinder honing is done in Barnesdrill vertical honing machines, handling six bores in alternate blocks.

Following the pressing-in of welch plugs and air test for leaks blocks enter another transfer machine, this one a six-station Ingersoll boring and milling machine. The second station presses in four cam bearings. Station 3 finish-bores the following: cam line, crank line, distributor bore, oil pump bore; and finish-reams two dowel holes. The last major operation is the finish-milling of the head surface at Station 5.

The blocks then are transferred to the Micromatic Horizontal honing machines for honing the crank line bores in one pass.

Management of cutting fluid plays an important role in machining the aluminum block. AMC employs a soluble oil mixture with generous flow rates to assure adequate cooling and chip removal. All of the cutting fluid is processed through Hydromation filtering units to remove chips and dirt before returning to the machine. ■



Telescoping rack-and-pinion design allows lifter arms maximum opening of 84 inches, minimum of 18 inches. Includes horizontal rotation to any position during 360° turning . . . pushbutton controlled by the crane operator.

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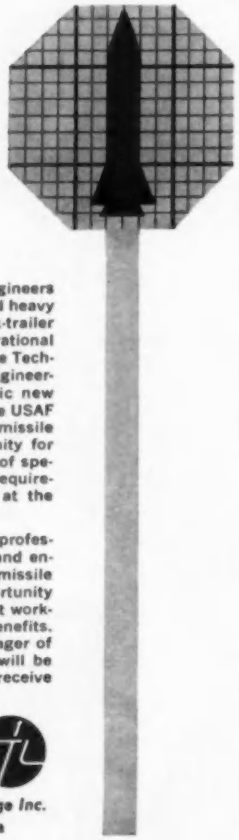
Wyman-Gordon Co. ..... 32



**Missile Transport Engineers**



STL offers opportunities for mechanical engineers with 10 years or more experience in off-road heavy construction equipment and highway truck-trailer combinations to design, test, and prove operational equipment used by the Armed Forces. Space Technology Laboratories is providing systems engineering and technical direction to a dynamic new application of automotive engineering to the USAF Ballistic Missile Program. This concept of missile mobility will provide challenging opportunity for candidates with imagination in the design of specialized automotive equipment to meet the requirements of state highway regulations and at the same time be transportable by sea and air.

STL is an expanding organization with a professional staff of more than 1700 scientists and engineers engaged in advanced space and missile programs. STL provides outstanding opportunity for professional growth, as well as excellent working conditions and exceptional employee benefits. Resumes directed to Dr. R. C. Potter, Manager of Professional Placement and Development will be treated in complete confidence and will receive immediate attention.

SPACE TECHNOLOGY LABORATORIES, INC.
*a subsidiary of Thompson Ramo Wooldridge Inc.*
P.O. Box 95005, Los Angeles 45, California

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**STARTING—MOTOR POWER SYSTEM**

- Eliminates need for automotive type battery.
- Special design of components, and improvements in rectifier design now makes it possible to provide an economical low voltage direct current source to replace the automotive type battery.
- Requires 220 or 440 volts single phase 60 cycle line.

**ADVANTAGES**

- Wet batteries eliminated completely.
- Eliminates toxic fumes battery odors, and corrosive elements.
- Ideal for cold room service.
- No starting contacts used on low voltage, high current.
- Permanent installation can be made.
- Simple push button operates in 220 or 440 volt line.
- Power available when it is needed.

ALECTRIC MANUFACTURING COMPANY
7842—39th Avenue, Kenosha, Wisconsin

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ASSISTANT EDITOR

### A. I. Index 1

The Index for the period of January 1 to June 15 is still available. It covers articles by: author; subject and company.

### Control Devices 2

GEA-7302, eight pages, describes the G. E. line of control pilot devices which includes pressure and vacuum switches, pressure governor, plugging and anti plugging switches, float switches, pilot switches and manual reversing switches. "Measurable Advantages" of each product are listed along with rating and nomenclature charts. Photos and diagrams are included to depict each of these devices. *General Electric Co.*

### Tooling Balls 3

Applications and specifications of hardened stainless steel tooling balls are covered in a 6-page bulletin. These products consist of a precision ball and shank, and are used in making and checking jigs, fixtures and machine setups. The bulletin shows how the center of the ball serves as a reference point in locating holes and surfaces at compound angles or in two or more planes. Photos and descriptions of shop applications are included, together with details and specifications on fixture balls (with plain shank) and checking balls with reference shoulder of ¼ to 1 in. ball diameter. *Ball Div. of Industrial Tectonics.*

### Storage Rack Device 4

A folder describes a new device which was designed to hold storage racks together firmly but still be easily removeable. Illustrations, line drawings and specification information are all given. There is also a list of applications and accessories shown. *Acme Steel Co.*

### Truck Selection 5

Meeting the growing challenge of "Proper Truck Selection" is the subject of a new 8-page brochure. This is the 5th of a series of technical brochures designed to give the materials handling engineers information which they can retain as a ready reference to their everyday handling problems. Listed are five ways that a mis-applied truck can damage your cost position. *Automatic Transportation Company.*

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### Tool Catalog 6

A new, 36 page catalog contains complete data on portable grinding tools and small hole drilling equipment. It includes all specifications, sizes, capacities and suggested applications for tool post grinders, flexible shaft tools, quills, Micro-Drills, high speed drill presses and automatic drill heads, fractional hp motors and grinding accessories. Numerous illustrations and technical matter are also shown. *The Dunmore Co.*

### Sprocket Data 7

Stock sizes of cast-tooth sprockets, available for immediate delivery in every major industrial area, are conveniently listed in a new 12-page book, No. 2867. Cast-tooth sprocket teeth are ground to fit the chain, and selection data in the new book is based on this "sprocket-to-chain" relationship. There are 132 different chain numbers listed and cross referenced to 48 sprocket lists. The complete range of types and sizes, considering all the many permutations, permits selection from over 30,000 sprockets in stock. *Link Belt Co.*

### Tangent Benders 8

New 12-page brochure describes a line of Air Operated Tangent Bending Machines. Specific information correlates bending radius with flange height that can be smoothly contained in compression or tension positions during tangent bending of sheet steel. Standard designs of machines are: single wing, duplex and quadruplex. Open-side and multiple-die designs increase production rates obtainable. Special bender designs are illustrated with combination equipments for full automatic fabrication lines. The *Taylor Winfield Corporation.*

### Metals and Chemicals 9

This eight page brochure lists the chemical composition and applications of more than 90 ferroalloys, metals and chemicals. Also listed are the locations of district offices and distributors. Among the products listed are alloys of aluminum, iron, chromium, columbium, manganese, silicon, titanium and vanadium. Silicon and vanadium metal and vanadium chemicals are also covered. *Vanadium Corp. of America.*

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## Technical Bulletin 10

This technical bulletin gives data and recommended use for eleven straight distilled Circo Oils with viscosities ranging from 55 SUS at 100 F to 140 SUS at 210 F. The bulletin recommends these oils for hydraulic and circulating systems operating below 120 F, where oil is constantly being replaced because of leakage, or where Fuller's earth filters are used to remove contamination and recondition the oils for extended use. It also recommends these oils for once-through application to plain bearings. *Sun Oil Company, Industrial Products Department.*

## Cold Heading Data 11

Illustrations by product groups of parts and fasteners, plus cold heading design information and sales representative directory now contained in a new 4-page bulletin S-100. Shown under headings of Rivets, Nails, Threaded Parts and Double Headed Parts are cold headed specialty items of interest to any industry. *John Hassall, Inc.*

## Production Control 12

This new Catalog is of interest to anyone having problems of speed measurement, production control, or quality control. It contains photographs and drawings and descriptions of 19 distinct types of flexible shafts and drives and drawings of various drive arrangements. *Jones Motrola Corporation.*

## Rotary Automation 13

A new 8 page, fully-illustrated catalog describes the capabilities of high speed, automatic six and eight spindle chucking machines. The catalog is designated as catalog No. 10 and is called "Rotary Automation." The tooling possibilities, engineering and construction of the Model 76-H, 6 spindle Chucker and Model 78-H, 8 spindle Chucker, are described in detail. Secondary machining attachments which increase versatility, speed production and cut manufacturing costs are graphically shown. The catalog lists complete specifications for both chucking machines and the availability of optional attachments to suit individual requirements. *The Baird Machine Company.*

## Urethane Foam 14

A new 24-page brochure, prepared as a dual-purpose pictorial progress report and designer's fact file on industrial and commercial applications for urethane foams, has been published. In easy-reading fashion designed for quick scanning, the booklet traces the development of urethane foams from their early days of fabrication a few years ago to the multiplicity of enduse functions that now mark the fast-expanding horizons for these materials. *Mobay Chemical Co.*

## Lock Washers 15

"This Washer Locks" is the title of a new book that covers Lock Washers in varied applications. The fact-filled, 8-page book shows the many features of these washers and is packed with informative schematic drawings, charts and photos showing "problem" applications. *Shakeproof Div., Illinois Tool Works.*

## Tubing Tool Catalog 16

A complete line of tubing tools is presented in a new 32-page catalog. Catalog No. 3121 is of vital interest to anyone who deals with tubing in such fields as maintenance, instrumentation, plumbing, heating, air conditioning, automotive, farm and other mobile equipment. It shows over 75 different Imperial tools and kits for all tubing work. This catalog contains 25 new items never before listed and 10 tools so recently developed that they have not been announced to the trade. *The Imperial Brass Mfg. Co.*

## Processes Bulletin 17

A 24-page bulletin gives a brief description of eighteen processes which includes the Company's three new nickel processes: Levelume 220, the improved Levelume, Permalume, the latest semi-bright process that can be continuously carbon treated and Superlume, the premium super bright, super-high-leveling bright nickel bath. New conversion coating processes Chem-Rite A-22, a conversion coating for aluminum and Chem-Rite Z-33, clear conversion coating for zinc are also briefly described. *Hanson-Van Winkle-Munning Co.*

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### Boring Machine 18

A colorful brochure describes and illustrates horizontal boring machines and has separate sections for each component that goes into the final unit. The booklet contains line drawings, illustrations and specification information. The index lists 29 separate subjects in alphabetical order and shows the page number. *The Bullard Co.*

### Selector Chart 19

This new Selector Chart shows the outstanding properties of key adhesives and hardeners . . . their tensile shear strengths at different temperatures and in several fuels. Also, the operating temperature range, izod impact, coefficient of thermal expansion and numerous other criteria are indicated. This guide fits into regular three-ring binders or, when folded out, makes an easy reference wall chart. *Hysol Corp.*

### Seamless Welding 20

Engineers, buyers, and estimators associated with piping will be interested in the new seamless welding fittings and flanges brochure. The 8 page booklet, designated FB-502A covers seamless welding fittings and flanges in carbon, alloy and stainless steels. The booklet includes charts of standard sizes and schedules according to ASA B36.10 and ASA B36.19. The booklet also contains a comprehensive breakdown of dimensional tolerances, illustrations of the most commonly produced fittings and flanges, and a chart of the sizes and types available. *Babcock & Wilcox Co.*

### Tool Booklet

A new, fully-illustrated 16 page catalog covers a line of carbide-tipped expansion reamers, solid reamers, end mills, spotfacers and counterbores furnished from stock; and special carbide-tipped tools made to specification. Please request on business letterhead: *Carr Tool Co., 3810 Hires Lane, Cincinnati 12, Ohio.*

### Tool Steel Data

A new 144 page catalog features a simple up to date selector for the 24 varieties of tool steel supplied by the company. It covers several new tool steels designed for various applications. Properties, composition and suggested application for each steel is shown. This information is followed by detailed instructions for heat treatment and a complete stock list. Please request the catalog on your company letterhead. Address to: *Darwin & Milner, Inc., 2222 Lakeside Ave., Cleveland 14, Ohio.*

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## it will still be as beautiful when she grows up

# UNILOY
## STAINLESS STEELS

Yes . . . when she's ready to drive her own car, she too will want the long lasting beauty and protective qualities of solid stainless steel trim . . . and if this car is still around, the trim will be just as beautiful as it is today.

For stainless that offers maximum ease of fabrication and lasting, lustrous finish, specify Uniloy Stainless Steel.

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STEEL CORPORATION
EXECUTIVE OFFICES: BRIDGEVILLE, PA.

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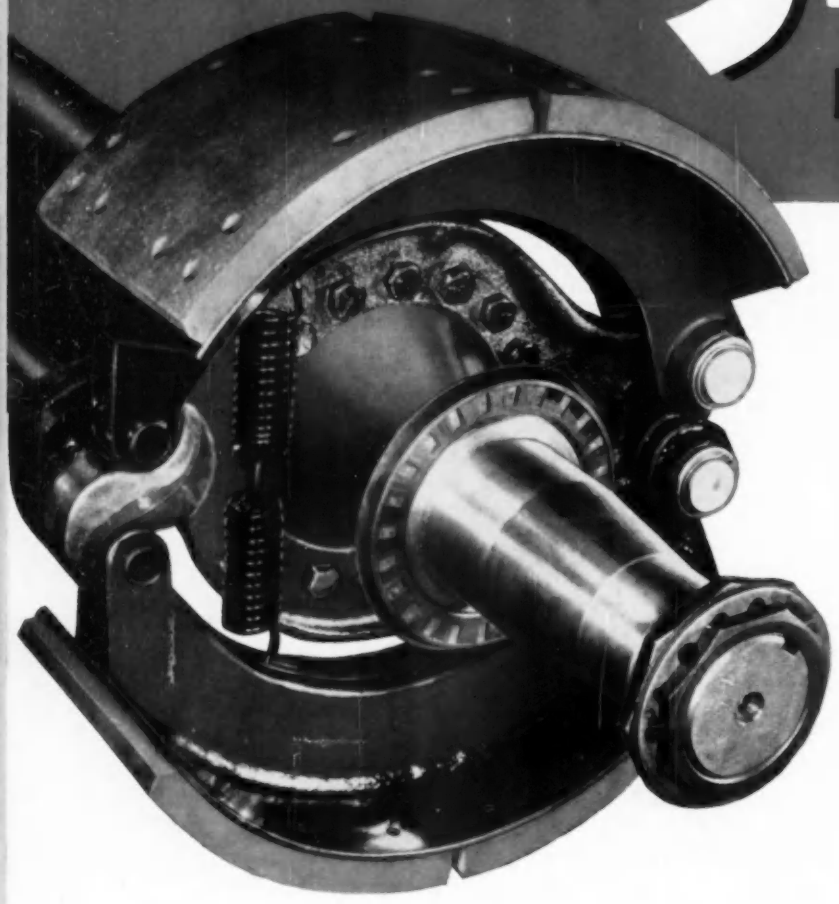
# your BEST BUY for the long run—

# SHULER

**FTL Series**

## Lightweight Brakes



These Shuler FTL Brakes (Fabricated Tapered Lining) have been re-designed for *minimum weight*—yet offer *exceptional* durability and long life. They feature:

1. **Fabricated steel construction for maximum strength.**
2. **High-quality tapered block lining riveted in place, and interchangeable with other makes of axles.**
3. **Shoes incorporate specially-designed channel rib section for additional rigidity without adding weight.**
4. **Large anchor pins with bushings of greater bearing area, for long life and less frequent replacement of bushings. Worn bearings are easily replaced, and brake shoes can be re-used repeatedly.**
5. **Hardened and ground roller shafts and cam rollers on the cam end of the brake shoes. The roller shafts are locked in place in the shoes and the cam roller turns on the shaft, not in the metal of the shoe.**
6. **Spiders bolt on, to permit replacement when necessary, without removing or replacing the entire axle.**

Write us for full details and quotations on these splendid brakes, proven by thousands of miles of trouble-free performance.

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Subsidiary of Fuller Manufacturing Company
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